

Enabling ICT for Rural India

by



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India, over the past decade, has become a test bed for innovations in information and communication technologies (ICT) serving the rural user. Various reasons explain this emergence. The most obvious may be that rural India has remained poor while the rest of the country has moved ahead.¹ Undoubtedly, its caste, religious, and other divisions present special challenges, as do its vast geography, many languages, and cultures.

The country's development strategy and institutional structure create additional problems. Agriculture is based on small-scale entrepreneurship and is capital-scarce. Hence, it relies on capital from the state-owned banking sector and government, including subsidies and handouts. The prolonged absence of self-sufficiency has created a dependent relationship of rural residents on officials from local government and banks. Locally elected officials and bureaucracy often mediate this dependency. Using ICT to bypass these relationships raises the risk that intermediaries will not be willing partners to change.

Despite large-scale political and bureaucratic attention and the more focused, small-scale efforts of thousands of nongovernmental organizations (NGOs) and other civil society entities, a replicable, catalytic approach to rural development remains to be found. The hope that ICT can surmount at least some of these social, political, and administrative challenges and become a viable technology for the provision of health, education, and other social services is thus ICT's strongest calling card.

Another reason is the large, underserved market that rural India's 700 million people represent (see, for example, Prahalad, 2004). These can include sophisticated services, such as cable TV for entertainment and voice telephony to negotiate rates for labor or produce (Dossani, 2002). Further, unlike many other developing countries, the country boasts a labor force skilled in ICT.

The object of this report is to explain the problems facing rural access to ICT and to make recommendations to improve access. Over three months, from September to December 2004, our team visited nine ICT projects and met their stakeholders. These ranged from 'outsiders' such as state-level officials who want to use ICT to provide social services, commercial firms that supply telecommunications services, district level revenue collectors and NGOs to

¹ As of 2001, India's rural population was 70 percent of the country's total but earned only 25 percent of its GDP. In 1951, the rural population was 83 percent of the country's total and earned 56 percent of GDP.

village residents and administrators who are consumers, intermediaries, and producers of ICT services.

We describe the lessons learned below, but, as a generalization, we concluded that all the projects are still experimenting with how best to serve rural users through ICT.

This report proceeds as follows: In Section 1.1, we describe the methodology. Section 2 discusses each project. Section 3 assesses the findings in terms of technology, content, and management. The concluding section, Section 4, suggests roles for the various stakeholders and proposes a framework for a pilot project.

1.1 Methodology

The study included field visits and in-depth follow-up with nine ICT initiatives, secondary research, and visits to several other project sites. The nine initiatives were selected on the basis of reputation, location, funding, administration, objectives, diversity, and scale.² Together they constitute a majority of the rural ICT services available in India.³ Projects surveyed and their respective states of location are as follows:

1. Bellandur Gram Panchayat, Karnataka
2. Boodikote Jagruthi Resource Center, Karnataka
3. eSeva APOne Centers, Andhra Pradesh
4. Gyandoot Government-to-Citizen Network, Madhya Pradesh
5. HP iCommunity in Kuppam, Andhra Pradesh
6. ITC eChoupals, Madhya Pradesh
7. M.S. Swaminathan Research Foundation InfoVillage Knowledge Centers, Pondicherry
8. n-Logue Chiraag Kiosks, Tamil Nadu
9. Warana Wired Village Project, Maharashtra

The projects are located in six, mostly southern,⁴ states and union territories. Their sources of funding include local and national governments, local and international NGOs, and private enterprise. Project aims range from empowering the poor with better information to managing supply chains. The largest project in our study boasts 5,500 kiosks, while the smallest projects claim only one.

At each site, we administered questionnaires to three groups: project authorities, center operators, and community members (users and nonusers). These groups can overlap, for example, the project authorities and center

² Availability of secondary information relating to each initiative also played a role in project selection.

³ Source: Interviews, Ministry of Communication and IT, September 2004.

⁴ Greater ICT experimentation seems to be occurring in southern states.

operators in Bellandur. Similarly, at MSSRF's Knowledge Centers, the center operators were also users. For projects with multiple sites, we visited at least two centers. A total of 89 questionnaires were completed.

Project authorities and center operators (collectively termed "infomediaries") responded to a common questionnaire that covered geographic and demographic information, history, objectives and stakeholders, center facilities, services and content, center usage and assessment, and project and center finances. A less comprehensive questionnaire was administered to community members, focusing on awareness, usage, and gaps between available and desired services. Both questionnaires appear in the Appendix.

2.0 Project Summaries

The projects offer three types of services:

Informational services disseminate generic (noncustomized) information, such as agricultural practices, weather forecasts, and contact information.

Transactional services involve an exchange of specific (or customized) informational services or funds between two or more parties using the ICT infrastructure. Examples include e-commerce and email.

eGovernance services refer to transactional services that involve local, state, or national government. Providing land records, submitting complaints to local officials, and confirming a user's presence on electoral rolls are examples.

While most sites offer multiple services, the following table shows that objectives can differ from services actually offered. Also, usage is sparse compared to potential, suggesting problems with awareness, infrastructure, or content.

Table 1: Summary of project sites

Project	No. of users/day vs. target population (per center)	Stated service objective	Primary service observed	Primary service content
Bellandur	200 vs. 30,000	Egovernance	EGovernance	Tax collection
Boodikote	20 vs. 25,000	Information	Business information	Loans and insurance
APOnline	75 vs. 15,000	Egovernance	Business transaction	Utility bills payment
Gyandoot	10 vs. 25,000	Egovernance	eGovernance	Forms, records
HP iCommunity	13 vs. 22,000	All services	Business information	Agricultural/veterinary
ITC eChoupal	25 vs. 2,000	Transactions	Business transaction	Agricultural/veterinary
MSSRF	22 vs. 3,000	Information	Business information	Agricultural
n-Logue	20 vs. 2,000	All services	Consumer transaction	Email
Warana	40 vs. 6,500	Transactions	Business transaction	Supply-chain management

Note: Potential usage varies with socioeconomic profile. If a mix of desired services is available, we speculate that a typical rural family will want, at a minimum, health services (say, 1 usage per 3 months); education and other information (1 per week); entitlement services (1 per month); email (1 per week); labor or crop information (1 per week); to pay utilities (2 per month); to pay taxes (1 per 3 months); and banking services (1 per month). This is 212 interactions per year or about 140 per day for the typical village with 200 families. Assuming that each interaction lasts 15 minutes, a single PC should be able to handle 60 users in a typical 15-hour workday. Therefore, a typical village of 1,000 persons should be able to support a kiosk with 2 PCs. Under these undoubtedly speculative assumptions and assuming that the infrastructure (number of PCs, connectivity, etc.) is adequate, usage of the above sites as percentage of potential is: Bellandur (5 percent), Boodikote (0.5 percent), APOne (3.6 percent), Gyandoot (0.3 percent), HP (0.4 percent), eChaupal (8.9 percent), MSSRF (5.2 percent), N-Logue (7.1 percent), Warana (4.4 percent).

2.1

Bellandur Gram Panchayat Computer System

General Information	
Project Authority	Bellandur Gram Panchayat
Location(s)	Bellandur, Bangalore East Taluk, Bangalore District, Karnataka
Number of centers	1
Population served	5 villages, 30,000 people
Communities served	Agricultural; many people also work in Bangalore city
Community literacy	80 percent
Project Description	
Objectives	Transparent and efficient bill collection
Stakeholders	<ol style="list-style-type: none"> 1. Bellandur Gram Panchayat—operates the system, provides space, initiated project 2. Village Development Committee—donated the computer. 3. Compusol (a software company)—developed the application, gave initial training, provides maintenance
Organization Structure	Gram Panchayat oversees and operates system
Capital cost	Rs. 64,000
Operating cost	Only salaries, estimated at Rs. 25,000/month
Revenues	Taxes and some fee-based services—Rs. 25 million per annum
Physical Infrastructure and Labor	
Physical Space	Gram Panchayat building
Employee Profile	5 employees who are computer diploma holders
Technology Infrastructure	
Hardware	5 PCs, 1 Server to host website and intranet, 2 printers, 1 modem, 1 UPS Video equipment for broadcasting meetings on local cable channel
Connectivity	Dial-up
Software	Translation software, community property tax payment system, Panchayat income tracking system, water bill system, basic accounting for the Panchayat
Devices used	PCs, TV for broadcasting Panchayat meetings
Electricity	Reliable
Service Analysis	
ICT Services Offered	<i>eGovernance</i> : Tax payment tracking, Panchayat document organization, Panchayat accounting, Meeting broadcast over cable television, access to public records
Content Providers	1. Infomediary
Languages	Kannada
Other Services	Printouts, local litigation support, tax collection
Fee Structure	Copy of land extract or printout of extract—Rs. 50 Taxes—Surcharge of 61 percent of regular property tax for sanitation, library, health, and education services
Publicity	Word of mouth, discussions with villagers
Maintenance	Compusol provides free maintenance
Number of users/day	200
Additional Income opportunities	More eGovernance services
Alternatives to ICT	Other media (telephone, television, newspapers)

Service Analysis

The Bellandur Gram Panchayat computer system was begun in response to community members' requests for increased public projects. The Gram Panchayat (village administration), in order to finance such projects, installed

a computer system for tax-revenue management. The system offers eGovernance services, consisting of bill payment and accounting for the Panchayat.

Computerization has improved revenue and cost transparency, thus reducing corruption, improving management, and raising users' willingness to pay. Beneficiaries attribute the rise in yearly tax revenues from Rs. 63,000 in 1993 to Rs. 25,000,000 in 2004 to the computer system, which has led to such public works projects as asphalt roads, streetlights, and an underground sewage system.

The project's location within the Gram Panchayat building means that users may also access additional Panchayati services.

Bellandur offers few informational and transactional services. The informational services cover basic government information (such as contacts and procedures) and local news. These are also available through signboards, paper documents, and local television broadcasts (which also broadcasts Panchayat meetings).

Desired services: eGovernance services: access to land records, ration cards, birth and death certificates and redress of grievances. Informational services: agriculture, education and health. Apart from entertainment services, no other transactional services were desired. This lack of awareness of ICT's transactional potential may be because users do not directly use the computers.

2.2

Boodikote Jagruthi Resource Center

General Information							
Project Authority	MYRADA (NGO)						
Location(s)	Boodikote, Kolar District, Karnataka						
Number of centers	1 with link to radio station; linked to 3 others in area						
Population served	35 villages served through 4 centers, Boodikote population: 3020, total catchment population estimated at 100,000						
Communities served	Agricultural; Serves SHGs and Community-based organizations (CBOs)						
Community literacy	45 percent						
Project Description							
Objectives	General informational resource; build capacity and linkages.						
Stakeholders	<ol style="list-style-type: none"> 1. MYRADA — Provides site, runs community radio to disseminate information gathered at the resource center 2. UNESCO — Provided equipment 3. National Informatics Centre — Provides enRICH software 4. VOICES (NGO) — Provides technical services, founded and operates radio 5. SHGs/CBOs — Use center for training, obtaining information 						
Organization Structure	Managed by SHG members. One of many MYRADA resource centers throughout three states						
Capital cost	Funded by Myrada, UNESCO, amount N/A						
Operating cost	Rs.4,000/month						
Revenues	Rs.750/month						
Physical Infrastructure and Labor							
Physical Space	1 room in community radio building						
Employee Profile	1 Resource Centre manager, 1 Resource Centre assistant, both with prior computer knowledge						
Technology Infrastructure							
Hardware	1 PC, 1 printer, 1 scanner, speakers						
Connectivity	None						
Software	enRICH for information management, Resource Center usage tracking, translation, Encarta reference						
Devices used	PC, Radio (through cable)						
Electricity	(Scheduled) 6 hours/day						
Service Analysis							
ICT Services Offered	<p><i>Informational:</i> agriculture, education, computer training, jobs, health, news, contacts, legal/finance, SHG support, government schemes and procedures</p> <p><i>Transactional:</i> Obtaining loans and insurance, buying/selling goods, applications for utility setup, entertainment</p> <p><i>eGovernance:</i> Form downloads, grievance redress</p>						
Content Providers	<table> <tr> <td>1. Infomediary</td> <td>4. Private providers</td> </tr> <tr> <td>2. Government departments</td> <td>5. Domain experts</td> </tr> <tr> <td>3. NGOS</td> <td>6. Community members</td> </tr> </table>	1. Infomediary	4. Private providers	2. Government departments	5. Domain experts	3. NGOS	6. Community members
1. Infomediary	4. Private providers						
2. Government departments	5. Domain experts						
3. NGOS	6. Community members						
Languages	Kannada, English						
Other Services	Photocopies and printouts, DTP, Local litigation/counseling						
Fee Structure	<p>SHGs/CBOs: Rs. 50/month</p> <p>Bank commissions: 1 percent of loans facilitated</p> <p>Printouts/Desktop publishing jobs—Rs. 50</p>						
Publicity	Word of mouth, print campaigns, via local NGOs/CBOs						
Maintenance	VOICES provides free maintenance						
Number of users/day	20						
Additional Income opportunities	ICT center operations, data entry, microenterprise development, employment training and placement						
Alternatives to ICT	Other media, panchayat						

Service Analysis

The Jagruthi Resource Center, set up in 2002, primarily addresses a wide range of informational needs, in line with its objectives. Informational services offered include basic agriculture, education, news and health information, information on managing Self Help Groups (SHGs), and legal and financial information concerning loans and insurance. Due to the absence of connectivity, the information is stored on the site's computer and updated regularly.

The center benefits from co-location and linkage with Namma Dhwani, the community radio, which is popular in Boodikote, through sharing of traffic and information.

Most community members are satisfied with the informational services.

A number of transactional services are offered, including explanations of procedures and printout of forms for loans, insurance and applications for utility setup, matching buyers and sellers of goods and services locally, and entertainment. However, without connectivity, transactional services are limited. Interestingly, users do not notice a shortage of transactional services.

Among the eGovernance services the center provides are form printouts and an opportunity to submit grievances to the local government.

Desired services: eGovernance services, such as various certificates.

2.3

eSeva APOnline Centers

General Information	
Project Authority	Tata Consultancy Services
Location(s)	Andhra Pradesh
Number of centers	1327 Rural Service Delivery Points
Population served	1327 villages, estimated 20 million people served
Communities served	Rural to semi-rural
Community literacy	Wide-range, estimated 20%-80%
Project Description	
Objectives	Single window interface for citizens to the government
Stakeholders	<ol style="list-style-type: none"> 1. TCS — also provided initial funding and runs the project. 2. Government of Andhra Pradesh — initiated project with TCS, provides content from an Internet data center, owns and operates the eSeva brand. 3. Rural Service Delivery Points — entrepreneur-run kiosks. 4. ICICI, HDFC — provide payment gateways for bill payment
Organization Structure	Public-Private Partnership: 11 percent AP Government AP, 89 percent TCS.
Capital cost	Rs. 6 million initial investment Rs. 35,000 per RSDP
Operating cost	TCS: Rs. 2 m/month RSDP: Rs. 4000/month
Revenues	Fee-based services — Rs. 3000/month per RSDP APOnline receives 20 percent of related RSDP revenues.
Physical Infrastructure and Labor	
Physical Space	STD/Internet kiosks, banks
Employee Profile	1 local entrepreneur trained for 1–2 days in computer and business operations
Technology Infrastructure	
Hardware	1 PC, 1 printer, 1 UPS, data encryption key
Connectivity	Cable or dial-up (64–100kbps)
Software	Internet browser
Devices used	PC
Electricity	Unreliable
Service Analysis	
ICT Services Offered	<p><i>Informational:</i> Education, jobs, contacts, government schemes and procedures</p> <p><i>Transactional:</i> Bill payment, obtaining loans and insurance, buying goods and services, applications for utility setup, entertainment</p> <p><i>eGovernance:</i> Form downloads, status of pending work, land records, ration cards, government certificates, licenses/permits, grievance redress, electoral enrollment, vehicle registration</p>
Content Providers	<ol style="list-style-type: none"> 1. Private providers 2. Government departments
Languages	Telugu, English
Other Services	Varies by center: Phone, architecture/building services
Fee Structure	Rs. 5 per transaction
Publicity	Word of mouth, campaigns, contests
Maintenance	Varies by center
Number of users/day	50–100
Additional Income opportunities	ICT center operations, computer training, data entry, eCommerce
Alternatives to ICT	Other media

Service Analysis

APOnline offers primarily “Government to Citizen (G2C)”, i.e., eGovernance services, over the Internet. eGovernance services include electric utility bills payment (85 percent of usage), uploading of electric utility setup applications, downloading of land records and applications for ration cards, government certificates, and vehicle registration.

Other services are also primarily Internet-based. These include both informational services (e.g., information on government entitlements, contacts, procedures, emergency services, educational and employment information) and transactional services (e.g., users can purchase commercial goods and services, such as movie tickets, travel packages, and download examination results). A few centers allow the user to operate the computers in order to browse the Internet or play games.

Desired services: eGovernance: submission of government applications and downloadable government certificates. Informational: Agricultural information. Transactional: Added eCommerce services, communication, ability to use the computers directly, and payment of other types of bills.

2.4 Gyandoot Government-to-Citizen Network

General Information	
Project Authority	Gyandoot Samiti
Location(s)	Dhar District, Madhya Pradesh
Number of centers	35 soochanalayas (centers)
Population served	Approximately 1,000 villages, 900,000 people
Communities served	Agricultural; large tribal population
Community literacy	50 percent
Project Description	
Objectives	Provide government-to-citizen services
Stakeholders	<ol style="list-style-type: none"> 1. Zilla Panchayat (ZP) & District Administration — Initiating agency, Gyandoot headquarters 2. Gram Panchayat (GP)—In 19 kiosks, meets setup costs and operating expenses 3. Gyandoot Samiti—Provides maintenance and software 4. Soochak—Operator, private entrepreneurs NIC provides technical support, software.
Organization Structure	ZP and Gyandoot Samiti maintain the network and software. GP (Model 1) or self-employed entrepreneur (Model 2) takes care of soochanalaya expenses. Under Model 1, soochak receives no salary and gives ZP 10 percent of revenue. Under Model 2, soochak pays Rs.5,000 p.a. to ZP
Capital cost	Rs. 2.5m initial investment for back-end, design and initial software Rs. 48,500 per soochanalaya
Operating cost	Model 1: <Rs.1,000/month Model 2: Rs. 5,000/month per soochanalaya
Revenues	Fee-based services—Rs. 4,375/month per soochanalaya
Physical Infrastructure and Labor	
Physical Space	GP buildings, private houses
Employee Profile	1 soochak who is a local matriculate. Gyandoot provides training.
Technology Infrastructure	
Hardware	1 PC, 1 printer, 1 UPS
Connectivity	Dial-up (56kbps), experimenting with CorDECT WLL at 3 sites
Software	Internet browser, land record software, translation software, photo software
Devices used	PC
Electricity	Unreliable
Service Analysis	
ICT Services Offered	<p><i>Informational:</i> Agriculture, education, computer training, jobs, health, contacts, government schemes and procedures, news</p> <p><i>Transactional:</i> Communication, availability and purchase of goods/services, banking, entertainment, photography, matrimonial</p> <p><i>eGovernance:</i> Form downloads and submission, status of pending work, land records, ration cards, government certificates, licenses/permits, grievance redress, “below poverty line” lists, vehicle registration</p>
Content Providers	<ol style="list-style-type: none"> 1. Government departments 2. Community members 3. Domain experts 4. Internet
Languages	Hindi
Other Services	Phone, photocopies, DTP, petition writing, cassette tape dubbing
Fee Structure	Rs. 5–25 per service, except for computer training at Rs. 200/month
Publicity	Word of mouth, campaigns, contests, soochanalaya inauguration
Maintenance	Annual maintenance contract by third party provided for first 3 years
Number of users/day	10
Additional Income opportunities	ICT center operations, computer training, content collection/localization, data entry, hardware maintenance, employment training and placement
Alternatives to ICT	Panchayat and other government servants, other media

Service Analysis

Gyandoot's objective is to provide eGovernance services, but it also offers an impressive array of informational and transactional services.

Through the Internet (though operated by the kiosk operator), users participate in buying and selling transactions, purchase horoscopes, email, and buy digital photographs.

Popular informational services include agricultural market rates and related information, job searches, government project and contact information.

Desired services: eGovernance: status of pending work and applications.
Informational: increased agricultural, educational, and health information.
Transactional: courier services, entertainment services (playing games and Internet browsing), financial services and long-distance telephony.

2.5

HP iCommunity in Kuppam

General Information	
Project Authority	Hewlett Packard
Location(s)	Kuppam, Andhra Pradesh
Number of centers	13 Community Information Centers, 3 Mobile Solutions Centers (vans)
Population served	231 villages, 285,000 people served
Communities served	Agricultural, mining
Community literacy	45 percent
Project Description	
Objectives	Provide government interface, bring about economic development, education, health, social empowerment
Stakeholders	<ol style="list-style-type: none"> 1. Hewlett Packard—Initiated project, provides funding, equipment 2. ICICI bank—Provides loans for CIC setup to entrepreneurs 3. World Corps India—Provides funding, training 4. America India Foundation—Provides education software 5. Datamation—Sends work to iCommunity ITeS centre
Organization Structure	Each CIC is intended to be autonomous as part of an in-store business that also provides other services
Capital cost	Rs. 135m initial investment Varies per CIC: Rs. 300,000–3.5m per center
Operating cost	Rs. 12,500/month per CIC (full-store)
Revenues	Fee-based services—Rs. 14,000/month per CIC (full store)
Physical Infrastructure and Labor	
Physical Space	Separate buildings, stores
Employee Profile	1 entrepreneur, trained by World Corps
Technology Infrastructure	
Hardware	1–4 PCs, 2 printers, 1 UPS
Connectivity	Wireless 802.11b (2Mbps) with tower in Kuppam
Software	Internet browser, translation software
Devices used	PCs, touch screens, Linux/441 machines
Electricity	Generally reliable, mobile centers rely on solar power
Service Analysis	
ICT Services Offered	<p><i>Informational:</i> Agriculture, education, computer training, jobs, health, contacts, government schemes and procedures, news, microenterprise training</p> <p><i>Transactional:</i> Communication, obtaining loans and insurance, entertainment, photography, astrology</p> <p><i>eGovernance:</i> Form downloads, ration cards, government certificates, grievance redress</p>
Content Providers	<ol style="list-style-type: none"> 1. Government departments 2. Domain experts
Languages	Telugu, English
Other Services	Phone, photocopies, DTP, CD burning
Fee Structure	Computer training—Rs. 250–500/month Computer services—Rs. 1–20 Soil testing—Rs. 150
Publicity	Word of mouth, campaigns, contests, through local NGOs/CBOs
Maintenance	WorldCorps provides maintenance
Number of users/day	5–20
Additional Income opportunities	ICT center operations, data entry, employment training and placement, microenterprise development
Alternatives to ICT	Other media

Service Analysis

Kuppam CIC's initial focus was eGovernance, but the shortage of digitized, ICT-enabled content and, later, regression even in the existing services

prevented this. For instance, Kuppam's users could submit applications for ration cards and birth and death certificates electronically until recently. The state government stopped accepting such applications in 2004. Current eGovernance services include government form downloads and submission of grievances and complaints.

As a result, CIC's broader goal now is to provide all ICT services. Informational services make up the bulk of Kuppam's offerings, covering information on government programs and contacts, agricultural and veterinary information, information on employment, education, and health and local news. SHG management information and computer training are also offered. Users are satisfied with these services.

Kuppam's transactional services include email, sale of insurance, horoscopes, and digital photographs. Entertainment services—web browsing, games, and watching movies—are popular.

Desired services: eGovernance: Electronic certificates uploading.
Informational: employment, education, and scholarships. Transactional:
Additional eCommerce and entertainment.

2.6 ITC eChoupals

General Information	
Project Authority	ITC—International Business Division
Location(s)	Madhya Pradesh (MP), Uttar Pradesh (UP), Andhra Pradesh (AP), Karnataka, Rajasthan
Number of centers	1750 in MP, 5,500 nationwide
Population served	31,000 villages, 3.1 million farmers served
Communities served	Agricultural
Community literacy	N/A
Project Description	
Objectives	Improve ITC's supply chain management
Stakeholders	<ol style="list-style-type: none"> 1. ITC 2. Sanyojak—Hub in-charge. 3. Sanchalak—Kiosk operator. 4. Consumer goods companies (26) whose goods are distributed through the eChoupal network
Organization Structure	3-tiered structure: <ol style="list-style-type: none"> 1. ITC; 2. Hubs and plants (hubs with processing capability); 3. eChoupals. ITC owns and manages the organization, meeting all costs and paying the sanyojak and sanchalak a commission for transaction done through eChoupal
Capital cost	Rs. 550m back-end costs Rs. 200,000 per center
Operating cost	Rs. 850/month per center
Revenues	Sanyojak/Sanchalak receive commission for transactions made through the choupal, estimated at Rs. 15,000/month per choupal
Physical Infrastructure and Labor	
Physical Space	Separate buildings, stores
Employee Profile	1 entrepreneur, trained by World Corps India
Technology Infrastructure	
Hardware	1 PC, 1 printer, 1 UPS
Connectivity	VSAT (up to 64 kbps per choupal)
Software	Internet browser, local language typing software
Devices used	PC, telephone
Electricity	3–4 hours/day, 2 backup solar panels per eChoupal
Service Analysis	
ICT Services Offered	<i>Informational:</i> Agriculture, government schemes and procedures, agricultural news and market prices, general FAQ <i>Transactional:</i> Communication, buying/selling goods, banking, obtaining insurance, entertainment <i>eGovernance:</i> Form downloads
Content Providers	<ol style="list-style-type: none"> 1. Government departments 2. Domain experts
Languages	Hindi, local languages
Other Services	DTP
Fee Structure	N/A
Publicity	Campaigns, Choupal inauguration
Maintenance	ITC hub engineers
Number of users/day	25
Additional Income opportunities	ICT center operations, data entry, employment training and placement, microenterprise development, increase in productivity
Alternatives to ICT	Other media, NGOs

Service Analysis

ITC is a large private buyer of agricultural commodities. The eChoupals were set up to facilitate their supply chain by buying directly from farmers. Hence, the primary objective of the eChoupals is transactional. In addition to selling their own produce, users can buy goods and services, email, and manage online banking and insurance.

Despite the transactional focus, informational services predominate. Agricultural market prices are by far the most popular informational service, but other agricultural and veterinary information, such as best practices and news, are also accessed. Government and financial information are also offered.

eGovernance services are underrepresented. Part of the reason is ITC's hesitation to partner with governments given the uncertain quality of response. Still, in Karnataka, the eChoupals have partnered with the state government to provide Bhoomi, a land record service.

Desired services: Informational: Health and educational information and nonagricultural news. Transactional: Telemedicine. EGovernance: Land records, additional government services such as information and access to government schemes.

2.7 M.S.Swaminathan Research Foundation InfoVillage Knowledge Centers

General Information	
Project Authority	M.S. Swaminathan Research Foundation
Location(s)	Pondicherry Union Territory
Number of centers	12 centers
Population served	12 villages; more than 35,000 people
Communities served	Agricultural, fishing; caters to SHGs
Community literacy	70 percent
Project Description	
Objectives	Strengthen information linkages with government. Provide pro-poor, pro-women, pro-nature approach to development.
Stakeholders	<ol style="list-style-type: none"> 1. MSSRF—Project-initiating agency, develops software, provides equipment. 2. Hub staff—Gathers and disseminates relevant information. 3. Village communities—Provides space, volunteers, operating expenses. 4. International Development Research Centre (IDRC), Canadian International Development Agency (CIDA), Ford Foundation—funding
Organization Structure	Hub and spoke model—Hub gathers and distributes information to the centers
Capital cost	Rs. 6m initial investment for back-end Rs. 375,000 per center
Operating cost	Not available
Revenues	Rs. 1500/month per center
Physical Infrastructure and Labor	
Physical Space	Temple room, Panchayat building, community hall, rented building
Employee Profile	3–4 volunteers trained in basic PC operations, management basics by MSSRF
Technology Infrastructure	
Hardware	6–7 refurbished PCs, 1 printer, 1 UPS, 1 web camera
Connectivity	6 centers 2-way VHF radio (7kbps), 6 centers 802.11b (2 mbps). All centers connected through a central VSAT-connected hub
Software	Internet browser, MS Office, Azim Premji Foundation educational software, MSSRF small-enterprise training CDs
Devices used	PCs, touch screens, public address system, siren, light beam (as lighthouse), digital sign board, newsletter
Electricity	Frequent outages. Backup solar panels in use.
Service Analysis	
ICT Services Offered	<i>Informational:</i> Agriculture, education, IT and SHG training, jobs, health, contacts, news, fishing, market prices, traditional knowledge, wages <i>Transactional:</i> Communication/entertainment, loans, accounting (SHGs) <i>eGovernance:</i> Forms, grievance redress, govt. schemes/procedures
Content Providers	<ol style="list-style-type: none"> 1. Infomediary 2. Government departments 3. Community members 4. Private providers 5. Domain experts 6. NGOs
Languages	Tamil
Other Services	Phone, DTP
Fee Structure	Computer services—Rs. 2–25 Computer or SHG Training—Rs. 300/certificate or session
Publicity	Word of mouth, through local NGOs/CBOs
Maintenance	Inhouse and MSSRF
Number of users/day	20–25
Additional Income opportunities	ICT center operations, computer training, content collection, data entry, microenterprise development
Alternatives to ICT	Other media

Service Analysis

MSSRF's InfoVillage emphasizes informational services. Much of this information is derived from the Internet and broadcast in innovative ways, such as the public address system at fishing villages or the siren that awakes fishermen when it is time for them to begin the fishing day. Local language newspapers and signboards outside the centers are also an effective way to spread knowledge. People in the InfoVillage communities report a high level of satisfaction.

Some transactional services are offered, but there are few eGovernance services. Communication is the most used transactional service, followed by loan applications. Entertainment and SHG accounting services are available.

Desired services: Community members note the absence of eGovernance services, expressing interest in land records, ration cards, distribution of information on government schemes, birth and death certificates, and status of pending work. Transactional: Income-augmenting services, including the online sale of goods.

2.8

n-Logue Chiraag Kiosks

General Information	
Project Authority	n-Logue Communications
Location(s)	Tamil Nadu, Maharashtra, Gujarat, Madhya Pradesh
Number of centers	2000
Population served	2000 villages, 4 million people
Communities served	Varies by center. Agricultural, mining, factory workers
Community literacy	Varies by center. 50 percent for Melur District, Tamil Nadu (site visited by team)
Project Description	
Objectives	To bring Internet to rural India
Stakeholders	<ol style="list-style-type: none"> 1. n-Logue— Provides rural applications, kiosk training/tutorials, publicity, infrastructure, licensing, most of the initial investment for access centers. 2. Local Service Providers—Local operators who pay set-up and operating costs, and share revenue with n-Logue. 3. Kiosk operator—Entrepreneur : buys access package, software, support. 4. Venture capitalists—Provide funding for growth 5. TeNet/IIT—Group of companies developing technologies for the project
Organization Structure	<ol style="list-style-type: none"> 3 tier: 1) n-Logue (central) 2) LSPs (access center within 25 km of kiosks) 3) Kiosk operators (village)
Capital cost	Rs. 4.5m per access center (regional back-end) Rs. 60,000 per chiraag kiosk
Operating cost	Rs. 3000/month per kiosk
Revenues	n-Logue/LSPs: Sell access, hardware, software, support to kiosks (50-50 cost split) Kiosk operators: Fee-based services— —Rs. 4000–20,000/month
Physical Infrastructure and Labor	
Physical Space	Private homes located in the middle of the community
Employee Profile	1 entrepreneur (preferably an educated female), trained onsite by central team. Follow-on training uses video manuals.
Technology Infrastructure	
Hardware	1 PC, 1 printer, 1 USB, 1 modem, 1 web camera, speakers, microphone
Connectivity	CorDECT WLL connectivity (35kbps) for the kiosks from the access center to the village. The access center is connected to wired bandwidth
Software	Internet browser, audio/video recorder, email program, videoconferencing, educational, photo editing, translation software
Devices used	PC
Electricity	Varies by site. Melur: generally reliable. Scheduled outages once a week
Service Analysis	
ICT Services Offered	<p><i>Informational:</i> Agriculture, education, computer training, jobs, health, government schemes and procedures, news, market prices</p> <p><i>Transactional:</i> Communication, purchase of goods/services, banking, obtaining loans and insurance, entertainment, photography, astrology</p> <p><i>eGovernance:</i> Form downloads, status of pending work, grievance redress, passport services</p>
Content Providers	<ol style="list-style-type: none"> 1. Infomediary 2. Government departments 3. Internet 4. Private providers 5. Domain experts
Languages	Local languages, such as Tamil, Telugu, Marathi, Gujarati, Hindi
Other Services	Varies by center—Phone, fax, photocopies, DTP, typewriting
Fee Structure	Varies by state: most services—Rs. 5–50 (more for education, astrology)
Publicity	Word of mouth, campaigns, TV advertising, contests, kiosk inauguration
Maintenance	Team at access center
Number of users/day	20
Additional Income opportunities	ICT center operations, computer training, content collection, data entry, microenterprise development
Alternatives to ICT	Other media

Service Analysis

n-Logue is India's largest operator of for-profit rural kiosks, under the "Chiraag" brand, focusing on fee-based transactional services. Examples include communication, digital photography, online banking, and provision of loans and insurance and entertainment services.

Chiraag kiosks provide a substantial number of informational services using content that is localized and stored on site. Basic informational offerings include agriculture, education, health, government programs, and local news.

n-Logue's aims include providing eGovernance services, but the absence of adequate digitized content—such as downloadable certificates—limit eGovernance services. Still, submission of grievances and passport and visa services are available.

Desired services: Informational: School admissions, and sports and entertainment news. eGovernance: Information on government programs, online registrations for enterprises and government programs and issue of land records and government certificates.

2.9

Wired Warana Village Project

General Information	
Project Authority	Warana Vibhag Shikshan Mandal
Location(s)	Warana Nagar, Kohlapur and Sangli Districts, Maharashtra
Number of centers	54 village booths
Population served	70 villages, 350,000 people
Communities served	Agricultural, Sugar factory cooperative
Community literacy	70 percent
Project Description	
Objectives	To make cooperative societies more efficient and transparent
Stakeholders	<p><u>Phase—I From July 1998 to January, 1999</u></p> <ol style="list-style-type: none"> 1. National Informatics Center— provided 50 percent initial financing, computer and communication equipment, software, training, support 2. Directorate of Information Technology, Govt of Maharashtra (GoM)— provided 40 percent initial financing, equipment for village booths, software, administrative and logistical support 3. Warana Vibhag Shikshan Mandal— provided 10 percent initial financing, provide current funding 4. Village booths— provide access at the village level <p><u>Phase—II From January, 1999 onwards</u></p> <ol style="list-style-type: none"> 1. WVSM 2. Village booths
Organization Structure	Sugar cooperative uses booths to ensure supply chain efficiency
Capital cost	Rs. 25M
Operating cost	Rs. 400K-500K/month total, borne by sugar cooperative
Revenues	Savings to sugar cooperative of Rs. 34m annually
Physical Infrastructure and Labor	
Physical Space	Pucca buildings (buildings with formal roof) in the community
Employee Profile	1 employee, trained by the sugar cooperative
Technology Infrastructure	
Hardware	1 PC, 1 printer, 1 UPS, 1 modem
Connectivity	Dial-up (32 or 56 kbps), experimenting with CorDECT WLL
Software	Sugar cooperative software, Translation/typing software, Internet browser
Devices used	PC
Electricity	Generally reliable
Service Analysis	
ICT Services Offered	<p><i>Informational:</i> Agriculture, education, jobs, news, market prices, <i>Transactional:</i> Sugarcane growth management program, communication, sale of goods (sugarcane), photography, astrology <i>eGovernance:</i> Form downloads</p>
Content Providers	1. Infomediary
Languages	Marathi
Other Services	DTP
Fee Structure	N/A
Publicity	Word of mouth, project inauguration
Maintenance	Sugar cooperative staff
Number of users/day	40
Additional Income opportunities	ICT center operations, computer training, data entry, employment training and placement
Alternatives to ICT	Other media, agricultural department field staff

Service Analysis

Warana's village booths support supply chain management through coordinating the growth and harvesting of sugarcane for the local sugar

cooperative. Additional transactional services include email services, digital photography, and astrology.

Informational services are accessed through the Internet and include agricultural best practices, market rates, local news and political developments, employment news, and information on children's education.

The village booths offer few eGovernance services, though they are widely demanded. As a sizeable number of eGovernance services—including licensing, submitting forms, and obtaining records—are available at district headquarters through Maharashtra's Sethu project, Warana Wired Village officials do not think it necessary to provide these services at the village level.

Desired services: Informational: Additional information on cultivation practices and crop disease control. EGovernance: Health information, government programs, services and contact information, land records, licenses, birth and death certificates, submission of government forms online and emails to government officials about grievances.

Introducing ICTs into a rural setting, which could be markedly disruptive, happened smoothly at every site. Though each project has benefited some user groups, none is significant enough to have had a general socioeconomic impact at its location, and none offers a replicable, catalytic model toward achieving such impact. Usage is disappointingly low, with some sites averaging five users per day, and most having fewer than twenty-five. Although it is difficult to measure self-sufficiency, it appears that self-supporting sustainability has not been achieved at even the sites with the highest revenue generation. The lack of sustainability means that the future goals of existing initiatives are likely to be sharply curtailed in the absence of new frameworks that can increase viability. The goal of creating a widespread rural ICT infrastructure, embodied, for example, in MSSRF's Mission 2007, which seeks to bring a Knowledge Center to every Indian village by the year 2007, seems a difficult task. Nevertheless, there are lessons from failures and challenges to date, as well as the successes. We will start with the bad news.

3.1 What Isn't Working

1. *Absence of useful content*

With some exceptions, such as Bellandur, the absence of a compelling ("killer") application rather than inadequate technology, location, electric power or management, is the reason for sparse usage (see Figure 1).⁵ Most rural ICT projects are, at best, in the same position as n-Logue's Chiraag kiosks, which, despite having an inventive technology infrastructure, are unable to attract users.⁶

⁵ Examples that succeed in adding value, such as Karnataka's Bhoomi taluk-based land record project, exist, but not at the local level.

⁶ One Chiraag operator we met with complained that adults in his village are more interested in movies and "timepass" than anything they might learn on the Internet. His daily clientele consists of about twenty children from neighboring villages who come to play on the computer.

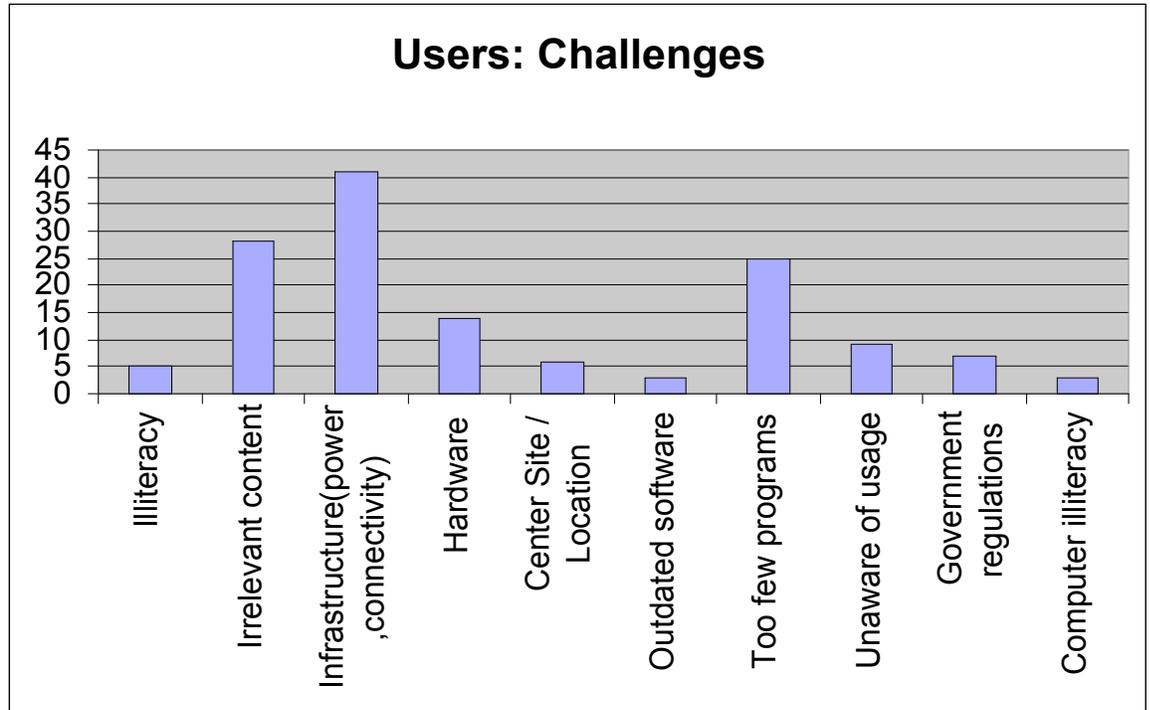


Figure 1: ICT Service Challenges as Identified by Users

Note: Vertical axis measures the number of respondents.

Both users and providers seem to be aware of this problem, as Figures 1 and 2 show. Users appear to be more concerned although largely unable to identify the specific programs they miss. Low content relevance is probably a combination of unfulfilled promises from government, language and other localization issues, poor awareness (among both users and providers) and inadequate understanding of user needs. The last-named might have arisen from inadequate operator selection and training, and lack of local listening. We discuss these further below.

2. *Lack of awareness among users*

In many cases, users were unaware of the full range of available services and concluded that the computer was either for a specific use, such as bill payment (APOnline) or accounting (Bellandur), or a toy (some of the n-Logue sites). For example, the agricultural advice system at Kuppam is vastly underutilized because farmers do not know that they can use it to interact with an agricultural extension officer. Similarly, in Gyandoot, many were unaware of the eGovernance services available, and viewed the kiosks simply as centers for telephony. Some sites did not allow customers to use the computer, thus reducing the benefits of experimentation and, potentially, causing low usage.

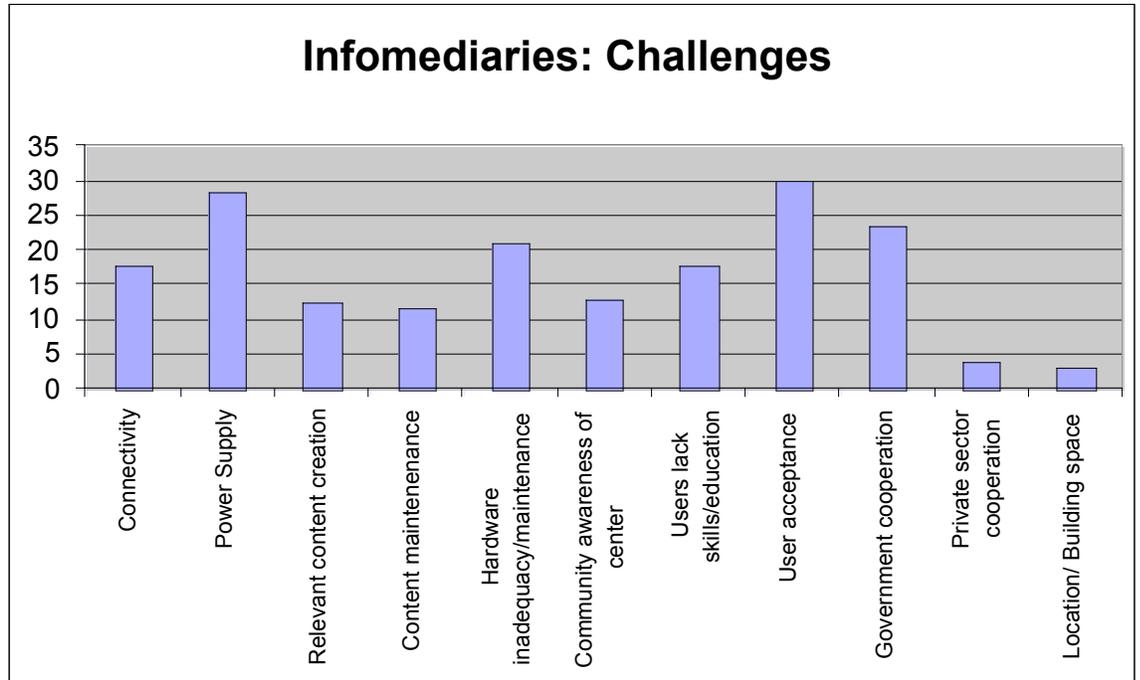


Figure 2: ICT Service Challenges as Identified by Project Authorities, Operators

Note: Vertical axis measures the number of respondents.

3. *Inadequate operator selection and training*

The center operator needs to understand the basic technology, such as how to navigate the Internet or to maximize the use of the available tools, and marketing. For example, at n-Logue’s Chiraag kiosks, we saw operators who were both proactive about recruiting users to their centers and those who were not. One Kuppam Community Information Center (CIC) was tucked quietly into a provisions shop, where it received few users and earned only Rs. 200/month in revenue. In both cases, usage was correlated with the operator’s level of ingenuity and effort.

4. *Segments of the population are sometimes excluded*

Several projects discriminate among the local population, usually unintentionally. For example, the eChoupal and Warana initiatives serve farmers, thus excluding the female and landless population. The eChoupals are located in individuals’ homes and the home-owner controls access. We visited more than one chaupal in Madhya Pradesh in which members of the backward castes were not allowed to enter the house in which the eChoupal was located. The dearth of female kiosk operators—though some initiatives like n-Logue and Gyandoot encourage women to become operators—also

discourages female clientele. Early on, several MSSRF Knowledge Centers located in houses were closed precisely because they were exclusive (now the organization, as a policy, locates centers only in public buildings). By contrast, Bellandur is an example of a project that, by design, serves all villagers.

It is impossible for a site to serve every villager and it could be argued that a viable starting point is key, even if it discriminates by plucking “low-hanging fruit”, such as the richer farmer. The question is whether an alternative approach, while focused on a single service, can address the broad scope of poverty, gender discrimination and lack of basic social services. Our findings show that, while usage is generally low across all the projects, levels of satisfaction are as high with projects, such as MSSRF Knowledge Centers, that are broad-based as those that serve wealthier segments.

5. Undefined expectations in sharing project management.

Several projects began as partnerships or involved contractual relationships among several parties. For some, failure was often attributed by one party to other parties that believed that their responsibility was complete. The failures involved both content and technological services. For example, in the Warana project (after the initial project phase), content maintenance was neglected, and technology frequently broke down. Village operators attributed these failures to external providers’ inability to provide skills that they did not and were not expected to have. This problem may be tied to the absence of a program to build-up rural capabilities prior to exit, thus compromising the project.

6. Government resistance to eGovernance

Government plays a very important role in rural areas as a provider of social and economic services and subsidies, and as tax collector. If adequately provided, eGovernance services could be the “killer application” that most initiatives lack. However, the government has failed to deliver eGovernance as promised. The problem appears to be less severe where the government has a financial or reputational stake. For example, APOnline has been able to provide bill-paying services due to the government’s financial involvement. On the other hand, n-Logue and Kuppam initially intended to serve as an interface to the government, particularly to provide official government documents, such as birth and death certificates, caste certificates, income certificates, and land records. Their expectations were based on promises from high government officials on the provision of electronic content. But this was an unsustainable basis and both projects could not provide eGovernance services because the government failed to provide digitized content.

Such a public-private partnership has other inherent problems. For example, consider the submission of complaints from the village to the district via a privately owned kiosk. There is no reason to expect such a system to be more efficient than the submission of a complaint by the postal service; and there is good reason to expect the system to be more inefficient than submitting the complaint in person and undertaking a face-to-face discussion with the concerned officer. The most efficient way might be to discuss the complaint with a locally elected official (over whom the villager is likely to have some political leverage) and have the official support the complaint by letter or endorsement prior to a manual submission.

An alternative may be to begin with eGovernance projects that are localized. This is because village officials are more likely to be accountable than more remote officials who work out of the state or district headquarters. The Bellandur project may, therefore, be a useful indicator of sustainable eGovernance.

Of course, there are no easy solutions. But the experiences described above do suggest the need to develop an innovative approach for the provision of eGovernance across all the Panchayati Raj institutions, i.e., not just at the village level, but at the block and district levels as well.

For example, suppose that it is possible to separate the tasks of remote eGovernance into types, as follows. The first type are tasks that are routine or standardized and require no decision-making on the part of a government official (such as requests for birth certificates, which are issued by the district). Such services, if digitized, can be handled by the private sector or by local government on behalf of the remote arms of government. Second are tasks that require discretionary decision-making by a remote government official, such as approving old-age pension claims. This does not appear to be fully outsourceable to either local government or the private sector. But parts of it, such as digitizing content, system maintenance, analyzing the claim against benchmarks and recommending the claim for approval or rejection to the appropriate district official can be done by the private sector. Similarly, local government can be empowered to make decisions on providing health services. Hence, with a re-engineering of how work flows are handled, there is probably a role for both local government and the private sector to provide such remote services. The decision to undertake such digitization and re-engineering remains as a policy challenge for institutionalization by both central and state government departments.

7. Lack of a realistic financial model

For all the projects, the costs of deployment are very high relative to revenue. The major deployment cost is building out the technology infrastructure. Despite claims by some site managers, usage at most sites is simply not high

enough to cover costs in the foreseeable future. This is true even for sites with high user satisfaction.

8. *Widespread infrastructural and hardware problems*

Both power shortages and connectivity are major issues. In seven of the nine initiatives, we witnessed significant power outages. The outages were most prevalent in Madhya Pradesh (eChoupal and Gyandoot) where some kiosks had power for fewer than four hours a day. While all of the projects do have Uninterrupted Power Supplies as backups, and some even have backup solar power, these backup supplies are ineffective against such massive grid power failure. In some locations, the UPS systems are broken or last for only ten minutes. The solar panels provide energy for only a few hours more.

Battery-operated devices that require intermittent charging may be a solution. However, most such devices, such as laptop computers, are currently designed for portability rather than to overcome the shortage of grid power, thus raising costs to unviable levels. Since most computing and transmission equipment is inherently low-power consuming, technological solutions to the problem of power outages may exist.

Connectivity is also an issue. For example, some Warana centers we visited (which had purchased connectivity from n-Logue) had been missing connectivity for two days at the time of our visit.

Failing hardware also poses a problem at some sites. For example, MSSRF machines, which are donated secondhand systems, are often unreliable and require costly maintenance that can offset the costs saved through buying secondhand. While making use of secondhand computers is an innovative idea, such an approach unduly burdens projects with maintenance costs. Warana faces a similar issue: systems at that site are now six years old and require significant maintenance.

9. *The projects have not adequately transferred capabilities to rural areas*

A key issue for sustainable rural development is the transference of capabilities to rural areas. The following table provides a “stages of growth” framework of how a typical process of transfer of capabilities might work.

Table 2: Stages of Growth in Rural Capability Enhancement

	Urban-based provider's role	Shared roles	Transferred to rural provider	Rural provider's additional roles	Projects
<u>Stage 1</u>	Content, finance, input sourcing, technology, shop-front design and quality control	None	Shop-front capacity and sales	None	HP iCommunity eChoupal
<u>Stage 2</u>	Technology, input sourcing	Content, finance, and quality control	Shop-front design	None	APOnline Gyandoot MSSRF n-Logue Warana
<u>Stage 3</u>	Technology, hardware sourcing	Software sourcing, finance, quality control	Content	Add content from other rural providers	Boodikote
<u>Stage 4</u>	Backbone technology	Finance, quality control	All sourcing, access technology	Add content from other urban providers	
<u>Stage 5</u>	Competitor	None	Backbone technology, finance, quality control	Subcontract to rural providers in other locations	Bellandur

The table above shows that most projects are still in the early stages of building rural capacity. Lacking financial viability, most projects have not looked beyond Stage 2 work. The inability to build rural capacity may be due to limited capabilities in the rural areas or in the way projects are designed. But the impact for long-term sustainability is obvious. Also, the relatively low level of rural involvement implies that content will not accurately reflect needs, a common problem as Figure 1 shows. Bellandur is an exception and reflects the unusual nature of the project (see also Table 1).

3.2 What Is Working

1. Use of the Internet as a carrier of informational services.

While few users or kiosk operators know how to search the Internet, sites that provide useful information such as local news and agricultural information are accessed online, thus supplementing local content. Warana's village booths, for example, carry only the software necessary for sugarcane management, but users use the Internet for accessing sites of local interest.

Strategies to leverage the Internet better are needed for several reasons. First, as noted, the Internet enables users to access information not available onsite,

especially when updated information is needed, such as the latest weather report. Second, it enables content developed for a given village to be used in villages. For example, if an NGO develops digital content to train users to monitor infant health, it may be more useful if that content is available over the Internet so that such training can be accessed more widely, such as by the NGO in contiguous villages or even, perhaps, by other NGOs in distant locations. Third, access to the Internet facilitates transactions, including eGovernance. Some sites, such as APOne and eChoupal, use the Internet for transactional services.

2. *EGovernance services attract the most users*

The villager is typically dependent on a range of government services: information on and employment in government projects; customized information such as land records and birth certificates; approvals, such as for 'below poverty line' status, and grievance redress; health, education, entitlement and other social services; mandatory services: taxation, updating land and population databases; exchange services: postal, banking and utility services. EGovernance, though sparsely provided, is the most popular service, perhaps owing to higher transparency and convenience.

For example, at APOne centers, users paying utility bills save travel over long distances at a small additional cost. Likewise, Bellandur's users benefit from higher transparency, which leads to less corruption.

3. *Path-dependency: Initially positive outcomes enhance acceptance and vice versa*

Providing one type of service effectively in order to capture a receptive audience, and then using that audience to capture more users and offer related services is at present the best method to increase usage and provide needed services (Moore 2002).

Bellandur's success in providing a transparent bill-paying service raised usage of related services, such as obtaining information on licenses and accessing public records of meetings. On the other hand, one of Kuppam's first projects (which offered eGovernance services such as certificates) failed, and appears to have affected its usage generally.

4. *Community involvement adds value to informational services*

The MSSRF and Boodikote initiatives are examples of community-based organizations that offer valuable informational services. In the fishing villages surrounding Pondicherry, for example, the MSSRF Knowledge Center saves lives by sharing expected wave patterns for the day. Because of its relationship with community members, the Boodikote center is made aware of

and is able to respond to local problems such as the shortage of nurses at the local Primary Health Centers.

This is not surprising, since communities know their needs best. As Figure 3 shows, rural people are likely to trust community-based organizations (CBOs) more than any other type of organization, including NGOs, government, or private enterprise (Narayan et.al., World Bank, 2000).

Institution	Responsiveness	Trust	Participation	Accountability	Unity/conflict resolution	Respect	Honesty and fairness	Caring, loving, listening
1 Municipalities and local government	—	—	—	—	—	—	—	—
2 Schools	—	—	—	—	—	—	—	—
3 Health services	—	—	—	—	—	—	—	—
4 Police	—	—	—	—	—	—	—	—
5 Politicians	—	—	—	—	—	—	—	—
6 Banks	—	—	—	—	—	—	—	—
7 Private enterprise and traders		—	—	—	—	—	—	—
8 Shops and moneylenders	+	+	—	—			—	—
9 Service delivery NGOs	—	+	—	—				
10 Emergency NGOs	+	+		—		+		+
11 Religious organizations	+	+	—	—	—	+	+	+
12 Community-based organizations	+	+	+	+	+	+	+	+
13 Local leaders	+	+		+	+	+		+
14 Kin and family	+	+		+				+

A positive rating (+) implies that the majority of responses were positive, and a negative rating (—) means that the majority of responses were negative. Blanks imply either that the criterion was not applicable or that there were insufficient data.

Figure 3: "Voices of the Poor" Figure Depicting Trust of CBOs

Source: Narayanan, D., et. al., 2000.

5. Partnerships for content development add value

Since content requires domain knowledge, it is perhaps a truism that content development would require partnerships with experts. Those recognizing this have done well. For example, n-Logue offers videoconferences and webchats across a region with experts on health, agriculture, animal husbandry,

education, government, and financial matters. HP's Kuppam CIC partners with financial institutions to provide banking and insurance services. MSSRF's InfoVillages are linked to many NGOs and local CBOs, such as the local coconut farmers association, the local dairy cooperative, and the Rajiv Gandhi College for Veterinary and Animal Sciences.

The need for partnerships in content development raises a problem: NGOs and government providers of ICT services at the local level have traditionally not looked to partner with each other or the private sector. We return to this problem later.

6. *Local language content adds value*

This is generally recognized by providers and users.

7. *Intermediaries improve usage*

At many sites, adults were hesitant to use computers. Hence, intermediaries can be important. The kiosk operator plays this role, often supplemented by children initially playing games. This was noticed, for example, in Gyandoot, an area with low levels of education and literacy. As we have noted earlier, however, the inability of end-users to use computers directly can be detrimental to overall usage of the kiosk.

8. *Attention to maintenance adds value*

At sites where the infrastructure often failed, such as at Gyandoot, either due to power shortages or poorly maintained computers, users were less willing to use ICT. By contrast, n-Logue and eChoupal manage infrastructure well with correspondingly higher usage. n-Logue has three engineers at each regional site, usually located within 25km of a kiosk. Additional engineers are located at zonal project sites, each of which oversees three access centers. At eChoupal, engineers are located at each hub (where farmers sell their goods), each responsible for 80 choupals. Though eChoupal in Madhya Pradesh suffers from the same electricity shortages as Gyandoot, the presence of solar backups and the engineers' contribution to ensuring connectivity helps it to garner more users than the Gyandoot project.

3.3 Technology Assessment

Connectivity

Since all district and most block headquarters have fiber, connectivity is primarily a problem of connecting the village to the block, a distance usually less than 25km. In addition, the Government of India has initiated a scheme known as the State Wide Area Network to extend connectivity to Block Headquarters. Assuming this scheme moves forward as planned, connectivity

up to the block level can be available by 2006. Some private sector firms are also engaged in such work.

The problem is of last-mile connectivity. Dial-up, cable/DSL, and wireless technologies are all possible and the sites visited employ these technologies. Wireless solutions save time but have hitherto not been cost-effective, though cheaper than building land-line solutions. They range in cost and quality as shown in the following table:⁷

Table 3: Wireless Connectivity Solutions

Technology	Range	Quality	Base-station cost (including towers and transmission equipment)	Receiving station cost	Receiving station can run on battery	Other factors
VSAT 64kbps	Unlimited	High	N/A	Rs.100,000	Yes	Mature
CorDECT WLL 35 kbps	25 km LOS	Medium	Rs.4,500,000	Rs.10,000	Yes	Locally supplied
802.11 2-108 Mbps	25 km NLOS	High	Rs.500,000	Rs.15,000	Yes	New tech
VHF 7 kbps	16 km NLOS	Low	Rs.250,000	Rs.250,000	Yes	Mature

Data Sources: VSAT: http://www.gogiacap.com/pro_ser_business_oppo.htm; CordectWLL; field interviews with N-Logue; 802.11; Atheros Technologies reports (www.atheros.com); VHF Data: ICT4D report, p. 70 (www.iiitb.edu, downloaded May 24, 2005); and field interviews; tower costs (required for CorDect and 802.11) at estimated height of 50 feet: Rs.500,000 (www.waverider.com/Library/costpart2.PDF).

Note: LOS/NLOS (line of sight/non-line of sight): 802.11 technologies are LOS, but can be adapted through innovative methods to be NLOS.

Devices

The PC is the standard device. Some sites, such as MSSRF, Boodikote, and Bellandur, supplement the computer with radio, TV, newsletters, and public address systems that use the information generated by the computer.⁸ There were no experiments with mobile devices for transactions or information.⁹

Given the unreliable state of power supply, some sites have experimented with solar panels (eChoupals and MSSRF), but these are too costly and provide

⁷ The recent delicensing of 2.4 GHz wireless bandwidth for external use promises to be a key development in making wireless connectivity the chosen method for deployment.

⁸ Makeshift lighthouses and simple signboards are also used.

⁹ APOnline has a PDA door-to-door bill payment service in the works.

limited backup. Battery-powered laptops, with 12-hour life (an adequate time between chargings), costing about \$1,000, may be a viable solution.

Secondhand computers also pose a problem at some sites (MSSRF, Warana) especially due to poor maintenance programs.

Software

The low usage of rural ICT sites is, as we have argued above, mainly due to the shortage of relevant digitized content. This is a problem not because of a lack of skills to digitize available content, but rather the difficulty of creating useful content cost effectively. While access to the Internet enables access to some useful content, there is a need for content designed for local use, particularly informational services created by NGOs/CBOs and transactional services led by eGovernance. Further, such content should be deployed over the Internet to increase access to more sites and to enable regular updating of information.¹⁰

If, as our study suggests, the “killer application” is eGovernance, the difficulty in initiating such a project can be high and appears to have adversely affected the feasibility of several projects. We shall return to this theme later in the discussions of a pilot project.

3.4 Information Network Assessment

The following “layers”, based on the Communications Convergence Bill, provide a framework to analyze the state of information networks.

Table 4: Communication Convergence Bill Layers

Convergence Bill Layer	Examples/Industries	Major Costs	Lifespan
Network Infrastructure Facilities (NIF)	Towers, wires, spectrum, Internet data center	Capital costs	Long (> 3 years)
Network Services (NS)	Switches, Routers, Base station	Capital costs	Medium (1–3 years)
Network Application Services (NAS)	<u>Up to premises:</u> Telephone lines, receiving stations <u>In-premises:</u> Computers, printers	Capital costs	Medium (1–3 years)
Content Application Services (CAS)	Telephony, data, music	Operating costs	Short (< 1 year)

¹⁰ Local language software does not sit well with English language keyboards. Introduction of local language keyboards would facilitate usage of the computers for users who do not speak or are uncomfortable with written English.

I. Network Infrastructure Facilities (NIF) and Network Services (NS)

These layers consist of the physical infrastructure to transmit information. At present, fiber connectivity is available at all district headquarters in the country, and will soon be available at all block headquarters. However, village access to this infrastructure remains a problem. This burdens providers of content application services (CAS), such as NGOs, who should be focusing their limited resources on providing adequate content, with the additional responsibility of providing the infrastructure to carry the signals from the district headquarters to the village.

II. Network Application Services (NAS)

The third layer refers to the manner in which data is transmitted (transport technologies), such as the Internet, and receiving equipment such as computers or telephones. A reliable NAS structure to transmit data to the village is not generally available. Again, this burdens CAS providers with the management of transmission, in addition to the NAS tasks that they might more reasonably be expected to do, such as installing computers to receive and manage signals.

III. Content Application Services (CAS)

The final layer defines the services and applications through which users can access information provided over the network. Web browsers and email clients fall into this category. This layer encompasses all the uses of the information network from the end users' perspective. The CAS layer relies more than the other layers on localization, because content must meet people's needs, which differ according to locale. Local language services, for example, fall into the realm of the CAS provider.

While all four layers must be in place, users interact with the CAS. If adequate content services are not provided, users will have no need for the entire information network. It is thus within the domain of providers of the CAS layer to improve the process of effectively determining user needs as well as in identifying those services for which people are willing to pay.

The last two columns of Table 4 indicate the nature of costs (operating or capital) and the lifespan of the different layers. The NIF layer consists of passive components such as towers, with slowly changing technology, and so has a longer lifespan. The NS and NAS layers' components have rapidly changing technology, but most components, such as base stations, are

designed to be in use for more than a year. The CAS' components are software-based and change frequently.

The differences in lifespans suggest that the installation and management of the different layers may be separated. Slower-changing components can be regulated effectively while faster-changing components should be unregulated and left to the marketplace. If this is done, then it may be possible to match skills and functions more effectively than at present. We return to this theme in the pilot project proposal below.

3.5 Content Assessment

The figure below shows the mix of services offered through the nine initiatives studied in terms of informational, transactional, and government services. The types of services offered correlate strongly to the type of management at each initiative. For example, Gyandoot and APOnline, which have government backing, offer more eGovernance services than the other initiatives. MSSRF, an NGO project, offered many informational services.

Overall, more informational services are being offered through these initiatives than transactional and governmental services combined. However, the most popular services are in the areas of eGovernance, followed by entrepreneurship or income generation, and health and medicine.

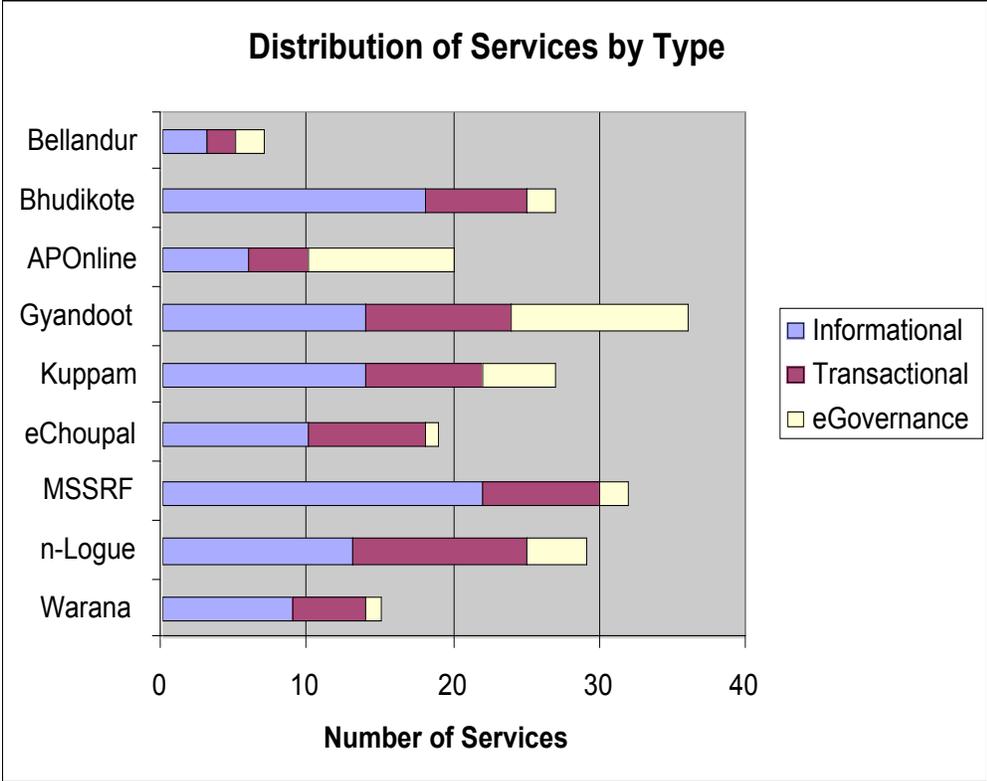


Figure 4: Distribution of Services by Type

3.6 Management Assessment

Management across the initiatives varies greatly, but the systemic factor appears to be the type and location of stakeholder, i.e., whether government, for-profit, or NGO/CBO, and whether decisions are made at the local (intra-district), district, or state levels. As the table below shows, efficiency in providing content is highest when management is located near users, and when the content provider and the source of content overlap. This is more important than type of ownership.

Table 5: Site Ownership and Performance

Site	Ownership	Organizational Range	Content Objective	Content Management Rating
Bellandur	Government	Village	Local EGovernance	High
Boodikote	NGO	State	Local and state info	High
eSeva APOOnline	Government-Private	State	State EGovernance	High
Gyandoot	Government	District	State EGovernance	Low
HP iCom	Private	National	All	Low
ITC eChoupal	Private	National	Local transactional	Medium
MSSRF	NGO	State	Local info	High
N-Logue	Private	National	All	Medium
Warana	Cooperative	Local	Local transactional	Low

The content objective tends to vary by ownership type. For example, NGOs/CBOs are nonprofit by mandate, tend to avoid for-profit transactional services, and focus on providing informational services based on their own expertise. They access eGovernance services where possible. Governments, similarly, avoid for-profit transactional services and focus on providing eGovernance services while accessing informational services where available. The private sector focuses on revenue, which it can earn from all types of services. Hence, the private sector tends to be more diversified in its content objectives. However, the private sector is unlikely to be able to provide

eGovernance and informational services on its own. Combined with our earlier inference that efficiency is related to location and overlap with the content provider, this dilemma is captured in the following table.

Table 6: Relationship of Type of Service to Level of Demand and Efficient Provider

Service	Rural Demand	Efficient provider
Local eGovernance	High	Panchayat government
District eGovernance	High	District government
State eGovernance	High	State government
Local informational	High	Local NGO
District informational	High	State NGO
State informational	Medium	State NGO
Global informational	Medium	All, assuming connectivity
Local transactional	High	Private
Dist transactional	Medium	Private
State transactional	Low	Private

At the very least, as the above table shows, partnerships are needed among providers for content. There are additional advantages of partnerships: these can help ensure that larger segments of the population benefit. This is both more socially equitable and, as discussed earlier, could be more cost-efficient.

However, sustaining such partnerships will likely be difficult due to the different objectives of the different management types. We shall return to this theme in our discussion of the pilot project.

The table below compares the efficiency of providers with respect to managing technology and the area over which management needs to be exercised.

Table 7: Efficiency of Management Entities in Providing Connectivity

Site	Organizational Range	Connectivity Type	Range of Operation (Quality of Service)
Bellandur	Local	Dial-up	Local (Medium)
Boodikote	State	None	None (Low)
eSeva APOnline	State	Cable/dial-up	District (High)
Gyandoot	District	Dial-up	Local (Medium)
HP iCom	National	Wifi (802.11b)	District (High)
ITC eChoupal	National	VSAT	State (High)
MSSRF	State	VHF (7kbps)/Wifi (802.11b)	District (Medium)
n-Logue	National	Cordect WLL (35 kbps)	District (High)
Warana	Local	Dial-up (32/56 kbps)	Local (Low)

Source: Survey data

Table 7 shows that in all cases, organizational range is at least as large as the range over which connectivity must be managed. This appears to be necessary for managerial efficiency. It is likely to be unmanageably costly otherwise for, say, a village-based organization to manage connectivity from the district or state to the village.

However, the quality of connectivity declines as it comes to lower levels, as the last column of the above table indicates. This arises because the connectivity provider, usually the state-owned Bharat Sanchar Nigam Limited (BSNL), is inefficient at rural connectivity.

To solve this problem, ideally, dedicated private-sector connectivity providers should manage connectivity at the district or state level up to the local level. We return to this in the pilot proposal.

The case for rural ICT is based on the need to accelerate the development of rural India using best practices and technologies. Our analysis above shows clearly that ICT is valued in rural India: wherever it has been introduced, the introduction has gone smoothly and value has been realized. Unfortunately, due to limitations of the scope of projects and unsustainable costs, the value is not yet sufficient to justify further experimentation without restructuring and infrastructural improvement.

Keeping in mind that, among remotely delivered services, the villager is least self-sufficient in government services, we have argued for a focus on government services. These services can go well beyond those currently envisaged. Consider, for example, postal services. The Indian postal service handles a range of transactional services, such as communicating customized information and banking services. If the ICT structure is efficient, both of these can be handled through the ICT kiosk. The sender of mail from, say, an urban area, can email her letter to a recipient in a rural area. The post office would receive the email at the kiosk, print it out, and deliver to the rural recipient; or even allow the recipient to read the email directly at the post office's kiosk. A similar set of solutions is possible for funds transfer.

The principles underlying the proposed model are as follows:

- (1) Government services are the most demanded, but most current sites focus on informational and transactional services. Hence, a model for public-private partnerships in the creation and delivery of eGovernance services is needed.
- (2) The cost of delivery is too high to allow for viability, thus requiring the use of public funds. A solution to using public funds needs to be carefully designed so as to retain incentives for competition and coverage within the private sector.
- (3) Understanding needs and providing services requires low-cost training to enable rural users to become self-sufficient users of ICT. NGOs are best situated to provide such services, thus requiring them to be a key element of any viable approach.

Our proposal for a pilot project, accordingly, consists of the following elements:

Managing costs

The costs of connectivity from the block to the village are currently borne by a single user, i.e., the village kiosk. Since the number of connected villages in

each block is also typically very few, the costs of connectivity from the district to the village is currently borne by a few users. Even in developed countries, connectivity costs are only bearable if spread over a wider user base.

Similarly, 6 of the 9 projects store information locally. This means that, in most cases, each kiosk must also bear the full costs of generating and storing content.

It is, therefore, likely that projects will be unviable even if the problems listed in Section 3.1 are resolved. One solution is to manage connectivity separately from content through the use of specialized providers and the use of universal service funds. This will, in turn, require unbundling the provision of the signal from the offering of content.

Hence, the solutions we propose to manage costs are:

1. The state should use universal service funds to deploy a network consisting of a data center at the state headquarters and a signal transmission infrastructure to the villages. All content service providers should be allowed to use the data center on a 'nearly-free' basis, eg., the first 100 MB could be provided without charge. The data center will be used to store content that can be accessed by a wide user base.
 - Note that remote storage has other advantages of access, updating, sharing with other groups and portability. For transactions with entities outside the village, remote storage is a necessity.
 - Since all district and most block headquarters have fiber (by 2006, both government and private fiber will be available at all blocks), the subsidy will be required primarily to connect the village to the block, a distance usually less than 25km. For the 'last-mile', dial-up, cable/DSL and wireless technologies are all possible options.
2. At the village, the current single-operator system should be replaced by allowing access of the signal to multiple operators – NGOs, the private sector and government entities (such as the panchayat and postal system). In other words, the signal should be treated as a public good.

The restructured network is summarized in Table 8 below. Note that since USO funds are proposed to be used, a regulatory structure will be needed to determine awardees and monitor them.

Table 8: Proposed Roles of Stakeholders in Creating the Network

Activity (and Location)	No. of Providers	MORD/PRI/ State govt	Village Government	Private Sector	NGO/ CBO	USO Funding
Network Infrastructure and Services (Block)	Single	Regulator		Subcontractor (BOO basis)		Yes
Internet data center - IDC (State)	Single	Regulator		Subcontractor (BOO basis)		Yes
Receiving station (Local)	Single	Regulator		Subcontractor (BOO basis)	Provider	Yes
Kiosk equipment (Local)	Multiple		Provider and Regulator	Provider	Provider	No

Note 1: Network Infrastructure and Services refers to the physical infrastructure, such as towers, spectrum and base stations, and related services, such as routing.

BOO: Build-own-operate

MORD/PRI: Ministry of Rural Development/Ministry of Panchayati Raj Institutions

Managing Content

As our findings show, management across the initiatives varies, but the factors that drive performance appear to go beyond providing commercial incentives (to which the private sector best responds). It is also important to assess need in some cases, such as the provision of healthcare entitlements, and to provide training, for both of which NGOs are better suited. However, NGOs are usually not used for these purposes, as noted above.

The table below matches content with the most efficient provider. Note that discretionary EGovernance can usually only partly be provided by a non-government provider. For example, getting grievances addressed requires action by a government official. However, portions of the service: collecting and sending the message, follow-up, etc., can be done by non-government entities.

Table 9: Proposed Roles of Stakeholders in Creating Content

Service	Rural Demand/ Complexity of Service	Efficient provider	Partner's role, if any
Local eGov	High/Medium	Local government	
Remote eGov – utilities	High/Medium	Private	Govt to digitize content and support partnership
Remote eGov – discretionary services	High/High	NGO	Govt to digitize content and support partnership
Local info	High/Medium	NGO	
Remote info	Medium/Medium	Private	NGO to provide content
Local transact	High/Medium	Private	NGO to train
Remote transact	Medium/High	Private	NGO to train

The findings above suggest the following:

1. EGovernance and essential (utility) services should be the “base-load” of a successful ICT project, ensuring a guaranteed demand for the service, while other services should be viewed as “peak-load”, whose demand will be subject to greater variability and will be more price sensitive.
2. Many services require partnerships in order to be efficiently delivered.

Summary of the proposed framework:

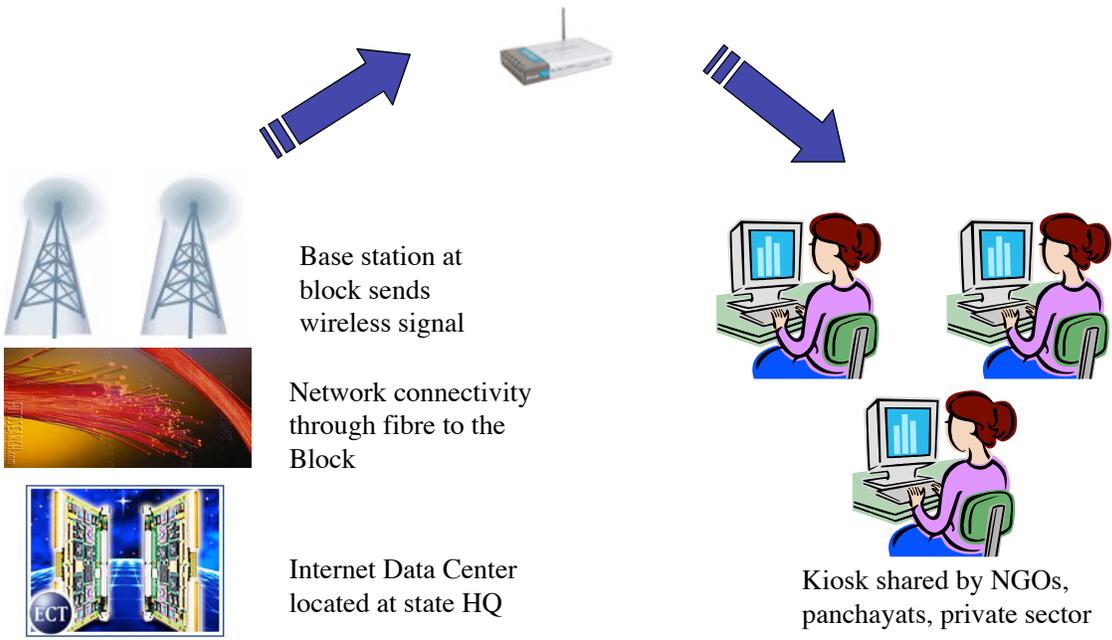
1. A data-center located at the state capital stores content. It is run by a private licensee under contract. USO funds pay for the center and enable ‘nearly-free’ access for NGOs and government entities. Note that the National Informatics Center is already in the process of providing such a data-center at each state capital. The same may be made available for rural ICT.
2. The signal from the block to the village can be sent by a variety of technologies. USO funds are used to pay for the transmission of the signal from the block. The network will be run by a private licensee under contract.
3. At the village, the signal is a common, free resource available to all providers. These may be co-located in order to reduce the receiving-station costs and they may also share other infrastructure such as PCs. The local government should mediate this process to ensure that all those receiving signals have fair access.

A framework of rules for managing the system upto local access should be provided to the state government by the Ministry of Rural Development/Ministry of Panchayati Raj Institutions.

The proposed framework is graphically represented below.

Proposed Model

Village kiosk receives signal



The following table summarizes how the restructured approach will respond to the challenges identified earlier.

Table 10: Discussion of Current ICT Challenges and Corresponding Structural Solutions

Needs	Solution	Incentive
Develop content	Separate content preparation from (USO-funded) connectivity and IDC	Releases funding for content; transfers technology mgmt to specialists
Raise user awareness	NGOs provide training	Increases usage
Improve operations	Private sector & NGOs provide training	Improves efficiency and usage
Include all segments	Multiple kiosks and village regulation	
More EGovernance	Increase private sector and NGO roles.	Greater transparency
Improve scale	IDC	Enables content developers to offer statewide access
Power and maintenance problems	BOO model under regulation	Maintenance built into contracts; low power devices supported via regulation
Build rural capacity	NGOs provide training	Regulatory support

4.1 Role of Government

As shown in the table above, an appropriate agency such as the Ministry of Rural Development, Ministry of Panchayati Raj Institutions, the State Departments of IT or NIC may regulate the network infrastructure up to the receiving station. Thereafter, the local (village) government needs to ensure that all those intending to utilize the signals from the receiving station have fair access. Such access could range from several PCs each owned by a different service provider (connected to the same receiving station) to a single PC with each service provider being allowed to deliver content through it (at commercial prices). Those offering content thus have the option to either store it on their own onsite equipment located at the kiosk, on onsite equipment owned by someone else, or on the Internet Data Centre (IDC). However, in the latter case, they would have to access it through onsite equipment (either their own or another party's).

Local Self Governments (Village Panchayats) should keep in mind the need for diversity so that all kinds of services— —informational, transactional, and eGovernance— —are included. Also to be kept in mind is the desirability of giving preference to those providers that will allow users to operate the PCs directly and will train users on computer usage and Internet search. A framework of rules for managing local access should be provided to the local government by the Ministry of Rural Development, Ministry of Panchayati Raj Institutions or state governments.

Governments— — state, district, and local— — should also contribute to the services offered through the kiosks, with a focus on the Internet as the medium for accessing services. Unfortunately, at the present time, government remains a limited eGovernance content provider. As a solution, governments could outsource the online provisioning of forms and utility payments to the private sector and make this service available throughout the state for anyone with Internet access. This could be made available in the local language of each state. The government should make downloads of its own forms and applications available without charge and allow uploads with credit card payment. For rural users, the kiosk operator could pay using her credit card and collect the fee in cash from the end user. In the long term, such a solution might prove very popular, given the demand for both government and financial services (a number of initiatives, such as APOnline, eChoupal, and n-Logue, are already experimenting with some variation of credit or debit card).

Initially, the focus of digitization might be on services that local self-government institutions, (i.e., village Panchayat, block Panchayat, and district Panchayat, also known as Panchayati Raj Institutions (PRIs)), could offer. These are the institutions that rural people approach most in their day-to-day life. A kiosk would offer great value simply by providing access to the relevant information from these local PRIs' information systems. The government appears to be moving in this direction. The Ministry of Panchayati Raj has already launched a National Panchayat Portal (<http://panchayat.nic.in>), which contains a dynamic website for each PRI. The PRIs can operate and update these websites with local content or services (including transactional services) using their own authentication systems.

A central governmental organization, such as a group within the Ministry of Rural Development/Ministry of Panchayati Raj, might initiate such an approach. As the direction-setting force behind the project, the steering body would set broad guidelines for rural ICT projects to follow, offering them up to the state government to actually enforce. The steering body may also draw members from other concerned organizations.

4.2 Example: Health Services Application

For a tangible example, we consider a health services ICT application as the anchor service.

Content/Content Application Services

- State government gives a statewide contract to a private provider of medical information.
- Provider offers over the Internet:

- General health information (equivalent to a local-language WebMD)
 - Answers to health-related questions
 - Preventive health seminars
 - Local health alerts and advisories
 - Tracking of local drug availability
 - Ordering of prescription drugs
 - First-aid training to community members.
- Community groups develop related content on, for example, how to use Internet-enabled health applications, health seminars, and first-aid training using content provided by the Internet application.
 - Operator is at liberty to offer any additional services through her kiosk.
 - Users access the health service by paying for Internet time at the kiosk.

Information Network

- Wireless connectivity is offered from the block headquarters to the surrounding villages. Initially, it should be restricted to a smaller radius than the technical maximum, such as 5km, to cover the most populous villages, which are assumed to be 30 in number (the average number of villages to a block is about 100). This is contracted out to a private provider. The work consists of setting up the tower, receiving station, and base stations. The last item is done in collaboration with the village government.
- The village government registers applications for setting up the kiosk and determines its equipment as discussed above.

Table 10: Health Services Cost Breakdown

	Year 1	Year 2	Year 3	Year 4	Year 5	Total	Management/Funding Source
State-level expenses							
Health Content	320,000	320,000	320,000	320,000	320,000	1,600,000	State government/USO
Block-level Expenses							
Network Setup	100,000	100,000	100,000	100,000	100,000	500,000	State government/USO
Network Operating	40,000	40,000	40,000	40,000	40,000	200,000	District government/USO
Kiosk-level Expenses and Revenues							
Kiosk Setup	10,000	10,000	10,000	10,000	10,000	50,000	Village government
Kiosk Operating	36,000	36,000	36,000	36,000	36,000	180,000	Kiosk operator
Kiosk Revenues	48,000	60,000	84,000	84,000	84,000	360,000	
Operator Income	12,000	24,000	48,000	48,000	48,000	180,000	

Notes:

1. Assumptions for health content costs: Two persons working out of a health clinic, billed at Rs.5,000/month/person. Data center assumed to be built for Rs.1 million, amortized equally over 5 years.
2. Network setup includes access center costs, including towers and equipment, amortized equally over 5 years. Network operating costs are assumed to require one engineer at Rs.40,000/year.
3. Kiosk set up costs based on data from n-Logue and Atheros Technologies.
4. Kiosk operating costs based on field surveys (see individual site tables).

Table 11: Health Services Cost per Kiosk over 5 Years

	Total 5-year cost	Cost per kiosk	Explanation
State-level	1,600,000	213	State-level costs/25 districts (250 blocks)/30 kiosks
Block-level	700,000	23,333	Taluk-level costs/30 kiosks
Kiosk-level	230,000	230,000	
Total cost per kiosk		254,000	
Total revenue per kiosk		360,000	
Benefit/cost per kiosks		1.42	Total revenue/Total cost per kiosk

Assumptions

- Interest-free government (or USO) financing for five years.
- State in question has 25 districts and each district has 10 blocks.
- Each taluk (block) supports 30 village kiosks.
- Village government has the opportunity to pay the full Rs. 50,000 or amount outstanding at any time before the five-year financing period is over. By default, kiosk setup costs are financed by the USO fund over five years.
- Kiosk usage: Rs.10/user x 20 users per day in year 1, growing over two years to 35 users/day

This exercise illustrates the efficiency of service deployment over the Internet once the needed infrastructure is in place. The revenue assumptions are based on current usage. As more users are drawn by the health service, the economies of scale will help to reduce average costs.

The use of ICT to enable rural development must rank as one of the developing world's greatest undertakings. India is the world's test-bed for this endeavor due to its IT skills, political support, and poverty. International and local funding agencies and NGOs, the domestic and international private sector, and the state have participated in the effort, now about a decade old. Our review focused on nine projects, selected for their diversity and reputation. We found that experimentation is still the order of the day for many reasons. Primarily, despite high user interest, the availability and affordability of relevant content and the information network remain major problems. As a result, most projects are not financially viable and have not met user or provider expectations on content or usage. Worse, the hope that ICT will overcome differences of income, caste, faith, and gender among rural populations has not been realized, and may even worsen the digital divide by creating a new one in rural areas.

While a single approach should not be chosen given the diversity in the field, we identified several common problems and linkages. Some were on expected lines, such as poor infrastructure, rapid obsolescence coupled with poor maintenance, the government's inability to provide content and challenges with local awareness, and quality of ground staff. Other problems, such as high deployment costs and widespread user perception of irrelevant content, are partly indicative of insufficient understanding of technology, of local capabilities, poor use of partnerships, and poor regulation. But these problems also exist because the strengths of the different stakeholders are not being used optimally. Thus, NGOs, which are strongest in understanding user needs and in training users on new approaches and technologies, have diverted considerable resources to accessing bandwidth and paying for kiosk infrastructure. As many of them are village-focused, these have missed a significant technological opportunity: that of maximizing availability through Internet-based provision rather than making content available only locally. This comment applies even to the larger NGOs that are not village-focused, such as MSSRF, and to the private sector. The private sector, in addition, appears to have an overly centralized approach in its effort to manage costs and quality, and must also deal with infrastructure problems that are outside its control, such as power problems.

Our proposal for a new ICT model is based on separating the infrastructure from content provision and recommending that: (1) the deployment of infrastructure up to the village be provided by technology specialists using universal service obligation (USO) funds. (2) a data center be provided at the state level in order to use content more efficiently. These approaches

recognize the public-good character of the technology infrastructure. The Ministries of Rural Development and Panchayati Raj Institutions should create a framework of rules to enable state management of this process.

At the village, we recommend that the private sector, NGOs and local government provide services under a competitive model, while village-level regulation should ensure that equitable access and partnerships are enabled.

Our proposal for a new ICT model is based on matching the capabilities of different stakeholders with functions. It will also provide a long-term basis for expanding rural capacity in ICT. The proposed model has the advantage of being financially viable. While it is robust enough to handle many types of services, being compatible with transactional, informational, and governance services, it confirms that focusing on a core service that is generally needed is a good starting point.

We propose that a pilot project be conceptualized and implemented, based on the above proposal. It will require the participation of multiple stakeholders at many levels, not just at the village level. We have listed the desired structure of partnerships and responsibilities in Table 8 and the subsequent example of a health care application. We propose, therefore, that the pilot project be driven by stakeholders representing all the groups listed in Table 8. The creation of such a partnership and a seed project are the logical next steps from this report.

Appendix A: Questionnaires

Questionnaire 1

Creating a Model for ICT Services in Rural Indian Communities: Survey Questionnaire
Target: Infomediary (Project Authorities and Center Operators)

Name of ICT service:
 Address of ICT service:

Respondent Profile

1. **What is the profile of the respondent?**
 - a) Name
 - b) Address
 - c) Age
 - d) Gender—M/F
 - e) Social Background—Religion
 - i) Hindu
 - ii) Muslim
 - iii) Christian
 - iv) Sikh
 - v) Any other, please specify
 - f) Social Background (Hindu)—Caste
 - i) Scheduled Caste
 - ii) Scheduled Tribe
 - iii) Other Backward Class
 - iv) Any other, please specify

Community Profile

2. (a) **What is the profile of the rural community?**

POPULATION	
LITERACY (percent)	
Illiterate	
Able to read (indicate languages)	
Able to read and write (indicate languages)	
Studied up to 5 th standard	
Matriculate	
Graduate	
Other, please specify	
PRIMARY OCCUPATION CATEGORY (percent)	
Landless labor	
Landowner	
Artisan	
Trader	
Self-employed (specify)	
Employed—government	
Employed—other (specify)	
Other—specify	
SOCIAL BACKGROUND (percent)	
Scheduled Caste	
Scheduled Tribe	
OBC	
Minority community	

Other	
FAMILY INCOME (ANNUAL RUPEES) (percent)	
< 10,000	
10,001–20,000	
20,001–30,000	
30001–40,000	
> 40,000	

2. (b) Demographic information

- a) Geographical location and name of village/rural area —
- b) Historical Background, if any —
- c) Demography —
 - i) Population —
- d) Natural Resources, if any —
- e) Climatic Conditions —
- f) Social Conditions —
- g) Economic Conditions —
- h) Facilities Available (Health, Transport, Education) —
- i) Infrastructure Available — —Electricity, telephone lines etc. —
- j) Effectiveness of Panchayati Raj Institution —
- k) Presence of Self-Help Groups —
- l) Current Usage of ICT —

Project Profile

3. (a) What is the brief history of the project?

- a) Founder —
- b) Date of initiation —
- c) Inspiration —
- d) Location of the project site —
- e) Major Partners & Roles —
- f) Key focus area(s) —
- g) Business Model —
- h) Major milestones —
- i) Major Achievements —
- j) Lessons Learnt so far —
- k) Any other important information —

3. (b) How many villages are covered under the ICT Project? Please specify the number of villages and population served.

3. (c) Are there other providers of ICT Services in the area? If so, what services do they provide?

4. (a) Was there any specific reason for selecting the project site(s)?

- a) Yes
- b) No

4. (b) If yes, please specify the reason(s).

5. Who are the stakeholders involved in the project? Please specify.

- c) Project Initiating Agency —
- d) Main Funding Agency(ies) —
- e) Local Support Agency(ies) —
- f) Technical Support Agency(ies) —
- g) Any other stakeholder(s), please specify —

ICT Centre Profile

6. What hardware is used in the ICT Service Centre?

- a) PC-Client(s) — Please specify the number
- b) Server(s) — Please specify the number
- c) Printer(s) — Please specify the number

- d) Modem(s)—Please specify the number
- e) UPS
- f) Any other, please specify

7. What communication infrastructure is used in the ICT Service Centre?

- a) Dial-up line
- b) V-SAT—Please specify the type
- c) RF
- d) WLL
- e) Remote Access Server (RAS)
- f) High-Speed/Cable
- g) Any other(s), please specify

8. Describe the physical facilities of the ICT Service Centre.

- a) Space used
- b) Power supply
- c) Air conditioning
- d) Number of employees at one time
- e) Access to manuals
- f) Any other(s), please specify

9. Who are the centre employees and how are they trained?

Information and Communication Services

10. Did you consult the rural people to find out their priorities and information needs?

- a) Yes
- b) No

11. If yes, what was the consultation methodology adopted to identify the information needs of the rural community?

- a) Participatory Rural Appraisal (PRA)
- b) Ethnographic Action Research
- c) Community Survey
- d) Informal Discussions
- e) Any other, please specify
(Try to obtain a copy of the appraisal report, if any)

12. (a) What are various categories of identified information needs?

12. (b) Are these needs different from the urban users? Explain.

- a) Yes
- b) No
- c) Partially different

13. What are the ICT services & information offered at the ICT Service Centre?

Informational Services	Place if service is offered	Place if service is relevant to community	Explain benefits, change in practices as a result of the ICT initiative, and remaining problems.
Cropping practices			
Animal husbandry			
Weather			
Permanent jobs			
Temporary jobs			
Children's education			
Adult education			
Children's health			
Adult's health			

Emergency			
Entitlements			
Other government services (informational)			
Personal and business contacts			
News			
Entertainment			

Fulfillment Services	Place if service is offered	Place if service is relevant to community	Explain benefits, change in practices as a result of the ICT initiative, and remaining problems.
Email			
Availability of consumer goods/services			
Availability of commercial goods/service			
Purchase of goods/service			
Ancillary services, such as account opening, credit, payment of bills, collection of receivables			

Government Services	Place if service is offered	Place if service is relevant to community	Explain benefits, change in practices as a result of the ICT initiative, and remaining problems.
Form downloads			
Status of pending work			
Land records			
Ration cards			
Birth and death certificates			
Caste certificates			
Licenses and permits			
Redress of grievances			

Examples of potential benefits: Remedies to veterinary problems, remedies to crop diseases, better prices for agricultural produce, timely weather information, easy availability of government forms, less time for government procedures, easy access to government information and services, less time for obtaining government certificates and documents, awareness about medical facilities, medical consultancy, awareness about educational facilities, career counseling, cheaper and easier communication through emails, computer education, improvement in general awareness.

Examples of prior practices: Visit government office in person, village mela, government functionaries (DSMS), rural haat, middlemen, cooperatives, travel to nearest service center or market.

Examples of potential remaining problems: Government information is not easily accessible, government procedures are complicated, government procedures consume too much time, government working is not transparent, slow response from government officials, corruption, little access to the outside market for buying and selling, little information about outside market prices or outside market trends, no means for publicizing the rural goods, involvement of middlemen.

14. Are people wary of using the technology?

- a) Yes
 - b) No
 - c) Initial reluctance, but felt comfortable later on
 - d) Any other(s), please specify
- 15. What are the working hours of the ICT Service Centre?**
- a) 9 Hrs— 12 Hrs
 - b) 14 Hrs— 17 Hrs
 - c) 17 Hrs— 20 Hrs
 - d) Depends upon electric power supply
 - e) 24 hrs a day
 - f) Any other, please specify
- 16. How many days a week does the ICT Service Centre operate?**
- a) 7 days a week
 - b) 5 days a week
 - c) 2 days a week
 - d) As and when the electric power supply is available
 - e) Any other, please specify
- 17. What are the software applications that are used in the Telecentre?**
- 18. Who developed the software applications?**
- 19. Do you use software that supports multiple languages?**
- a) Yes
 - b) No
- 20. Do you provide content in local language?**
- a) Yes—Please specify the language
 - b) No
- 21. Who provides the content? (Tick all that apply)**
- a) Locally created by infomediary
 - b) Outsourced to private sector providers (please list)
 - c) Government departments
 - d) National Remote Sensing Agency
 - e) Meteorological department
 - f) Domain experts (from Health, Agriculture, Education etc.)
 - g) Community members
 - h) Collected from Internet by infomediary
 - i) Any other(s), please specify
- 22. How do you manage the translation of content received in other languages to local language?**
- a) Do content translation on our own (by infomediary)
 - b) Engage a third party for content translation
 - c) Create and accept content only in local language
 - d) Any other(s), please specify
- 23. How is content received?**
- a) On floppies
 - b) Through Email
 - c) Online using Internet
 - d) Any other(s), please specify
- 24. Is there an exchange of content within community and among communities?**
- a) Yes
 - b) No
 - c) Not yet, but plan to do so in future
 - d) Can't say
- 25. In case there is a content exchange, please specify the mechanism.**

- a) Through email
- b) Online using Internet
- c) Using broadcast satellite
- d) Any other(s), please specify

26. What are the devices that are used by community people for accessing ICT services?

- a) PCs
- b) Touch screen kiosks
- c) PDAs
- d) Mobile phones
- e) Any other(s), please specify

27. What are the challenges faced in providing ICT services?

	Rank: 0: not a bottleneck 1: unimportant 2: slightly important 3: average 4: important 5: very important bottleneck	Strategies in response to bottlenecks
Connectivity		
Power supply		
Content		
Content customization and maintenance		
Hardware inadequacy and maintenance		
Users lack skills		
User unawareness		
Cooperation in back-end services—government		
Cooperation in back-end services—private		

Examples of strategies: Creating awareness about the benefits of ICT services among rural people, deliver information and services based on the needs and priorities of the rural people, simplification and contextualization of content, provide content in local language, provide information through audio-enabled software interfaces.

28. What are the other services offered at the ICT Service Centre?

	Place if service is offered	Place if relevant to community needs	List benefits and comments, if any
Phone (STD/Local)			
Fax			
Photocopy			
Computer jobs/DTP			
Any other, please specify			

29. On an average, how many villagers visit the ICT Service Centre in a day?

30. How do you promote/popularize the services provided by the ICT Service Centre? Also indicate how often such promotion is done.

- a) By word of mouth
- b) Discussions with villagers
- c) Road Shows
- d) Campaigns
- e) Any other(s), please specify

31. What was the capital cost of setting up the ICT Service Centre (in Rs.)?

32. How much is the per month operational cost of the ICT initiative (in Rs.)?

- 33. How do you meet the operational cost? Indicate percentage of operating budget covered by each.**
- a) Through fee-based services
 - b) Through funds provided by government (local/district/state—please specify)
 - c) Through funds provided by NGO/Local Support Agency
 - d) Any other(s), please specify
- 34. In case of fee-based operations, what are the chargeable services, please specify?**
- 35. How do you charge in case of a fee-based service, please specify?**
- a) Per hour usage of Internet—(also specify the amount)
 - b) Per service basis—(also specify the service and corresponding amount)
 - c) Any other(s), please specify
- 36. How is the ICT infrastructure maintained?**
- a) Vendor based maintenance (AMC)
 - b) Local people trained by the initiative
 - c) Local vendor
 - d) Any other(s), please specify
- 37. What economic opportunities do you envisage for the local people through this ICT initiative? (Tick all that apply)**
- a) ICT Service Centre operations
 - b) As trainer on computer-related courses
 - c) Content collection
 - d) Content localization
 - e) Data entry operations
 - f) Hardware maintenance
 - g) Any other(s), please specify
- 38. Does the project have a mechanism for assessing its impact?**
- a) Yes
 - b) No
- 39. If yes, please specify the impact assessment mechanism.**
- a) Software-based analysis of visitors behaviour and access pattern of the ICT service
 - b) Ethnographic Research
 - c) Other Research
 - d) Any other(s), please specify
- 40. Has the initiative demonstrated scalability and replicability?**

Questionnaire 2

Creating a Model for ICT Services in Rural Indian Communities: Survey Questionnaire

Target: Community People

Name of ICT service:

Address of ICT service:

1. What is the profile of the community person?

- b) Name
- c) Address
- d) Age
- e) Gender: M/F
- f) Literacy Level
 - i) Not able to read or write
 - ii) Able to read
 - Indicate languages
 - iii) Able to read and write
 - Indicate languages
 - iv) Studied up to 5th Standard
 - v) Matriculate
 - vi) Graduate
 - vii) Any other, please specify
- g) Primary Occupation
 - i) Landowner
 - ii) Landless labour
 - iii) Fisherman
 - iv) Artisan
 - v) Trader
 - vi) Self Employed
 - vii) Employed—government
 - viii) Employed—other
 - ix) Any other, please specify
- h) Social Background—Religion
 - i) Hindu
 - ii) Muslim
 - iii) Christian
 - iv) Sikh
 - v) Any other, please specify
- i) Social Background (Hindu)—Caste
 - i) Scheduled Caste or Tribe
 - ii) Other Backward Class
 - iii) Any other, please specify
- j) Family Income level (in case respondent would like to state average over the past few years, that would be okay. This may happen because of the high variability of such income.)
 - i) Annual Income < Rs. 10,000
 - ii) Annual Income between Rs. 10,000–Rs. 20,000
 - iii) Annual Income between Rs. 20,000–Rs. 30,000
 - iv) Annual Income between Rs. 30,000–Rs. 40,000
 - v) Annual Income > Rs. 40,000, please specify the amount
- k) User of ICT/Nonuser of ICT
- l) Any other important information

2. What problems do you face in your day-to-day life? What information needs do you have? (Complete first part of #9)

3. Are you aware of the ICT Service Centre in your area?

- a) Yes
- b) No

4. Do you think the ICT Service Centre can address these problems?

- c) Yes
- d) No

[If respondent is not aware of ICT service, stop questioning here]

5. Are you a user of the local ICT service?

- a) Yes
- b) No

6. Where is the ICT Service Centre located?

- a) Community Centre
- b) School
- c) Village Panchayat Office
- d) STD/PCO Booth
- e) Place of Worship
- f) Post Office
- g) Any other place, please specify.

7a. Are you able to access the ICT service easily?

- a) Yes
- b) No

7b. If No, what are the problems faced in going to the ICT Service Centre? (Tick all that apply)

- a) Located at a distant place (from the residence of the user)
- b) Located at a place where entry is restricted because of social background (e.g., temple, house of a high-class community person)
- c) Not allowed access because of gender bias
- d) Unable to pay the fee for accessing the ICT service
- e) Unable to access because of other pressing livelihood needs/jobs
- f) Working timings at the centre not suitable
- g) Any other(s), please specify

8a. Were you consulted about your information needs and services prior to the establishment of the ICT service?

- a) Yes
- b) No

8b. If yes, how was the consultation carried out? (Tick all that apply)

- a) Meetings with members of village Panchayat
- b) Meetings with selected families in the community
- c) Meetings with self-help groups
- d) Meetings with different sections of the community — Women, Youth, Elderly, Scheduled Castes/Scheduled Tribes (SC/ST) (please specify)
- e) Any other(s), please specify

9. Has the ICT Centre addressed your needs?

Need/Problems	Place if identified as problem	Place if ICT Centre services address this need	Explain benefits, change in practices as a result of the ICT initiative, and remaining problems.
INFORMATION SERVICES			
Cropping practices			
Animal husbandry			
Weather			
Permanent jobs			
Temporary jobs			
Children's education			
Adult education			
Children's health			
Adult's health			
Emergency			
Entitlements			
Other government services (informational)			
Personal and business contacts			
News			
Entertainment			
FULFILLMENT SERVICES:			
Email			
Availability of consumer goods/services			
Availability of commercial goods/services			
Purchase of goods/services			
Ancillary services, such as account opening, credit, payment of bills, collection of receivables			
GOVERNMENT SERVICES:			
Form downloads			
Status of pending work			
Land records			
Ration cards			
Birth and death certificates			
Caste certificates			
Licenses and permits			
Redress of grievances			

Examples of potential benefits: Remedies to veterinary problems, remedies to crop diseases, better prices for agricultural produce, timely weather information, easy availability of government forms, reduced time for government procedures, easy access to government information and services, reduced time for obtaining government certificates and documents, awareness about medical facilities, medical consultancy, awareness about educational facilities, career counseling, cheaper and easier communication through emails, computer education, improvement in general awareness.

Examples of prior practices: Visit government office in person, village mela, government functionaries (DSMS), rural haat, middlemen, cooperatives, travel to nearest service center or market.

Examples of potential remaining problems: Government information is not easily accessible, government procedures are complicated, government procedures consume too much time, government working is not transparent, slow response

from government officials, corruption, little access to the outside market for buying and selling, little information about outside market prices or outside market trends, no means for publicizing the rural goods, involvement of middlemen.

10. What are other services provided at the ICT Service Centre? (Tick all that apply)

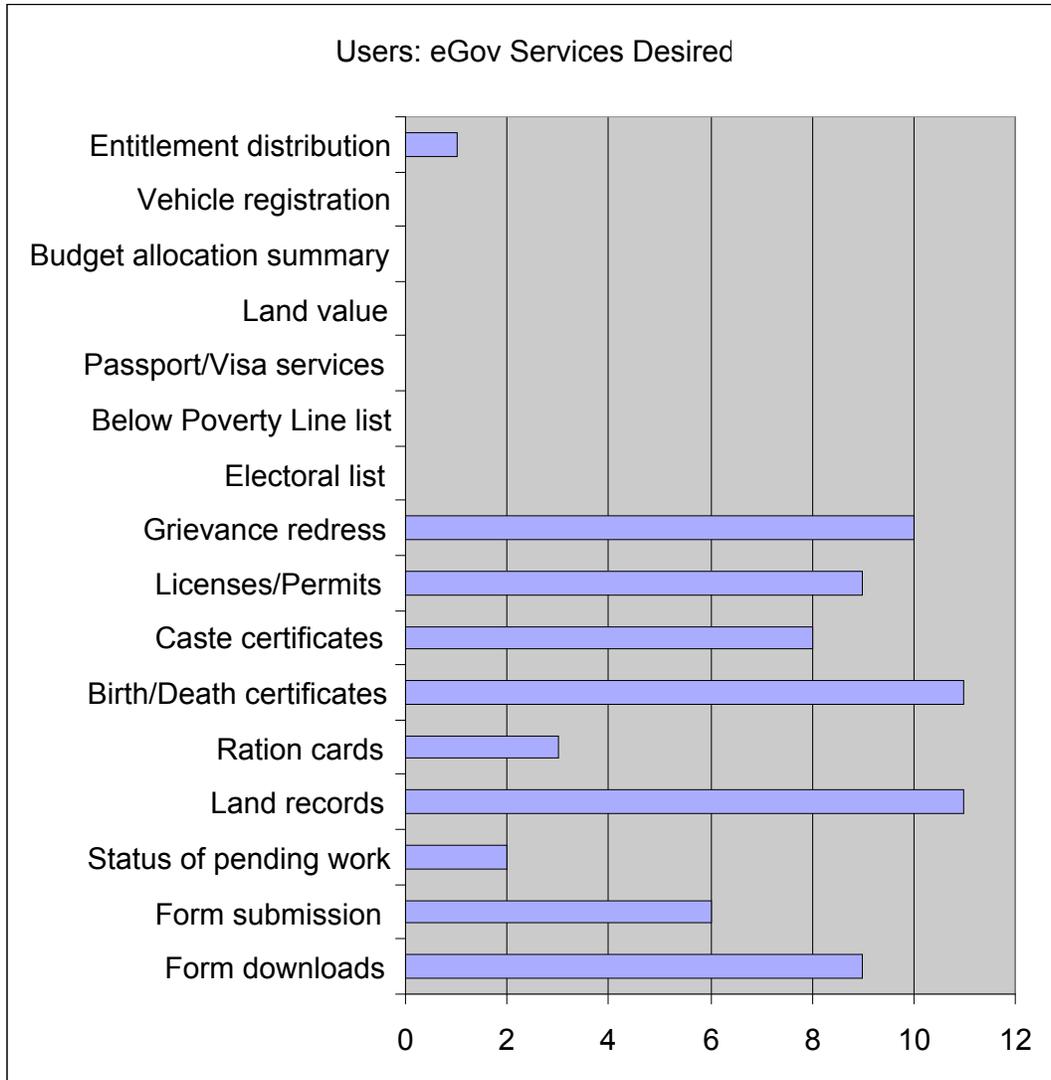
	Place if service is offered	Place if relevant to community needs	List benefits and comments, if any
Phone (STD/Local)			
Fax			
Photocopy			
Computer jobs/DTP			
Any other, please specify			

11. Do you find the services listed in 9 more useful than services listed in 10?

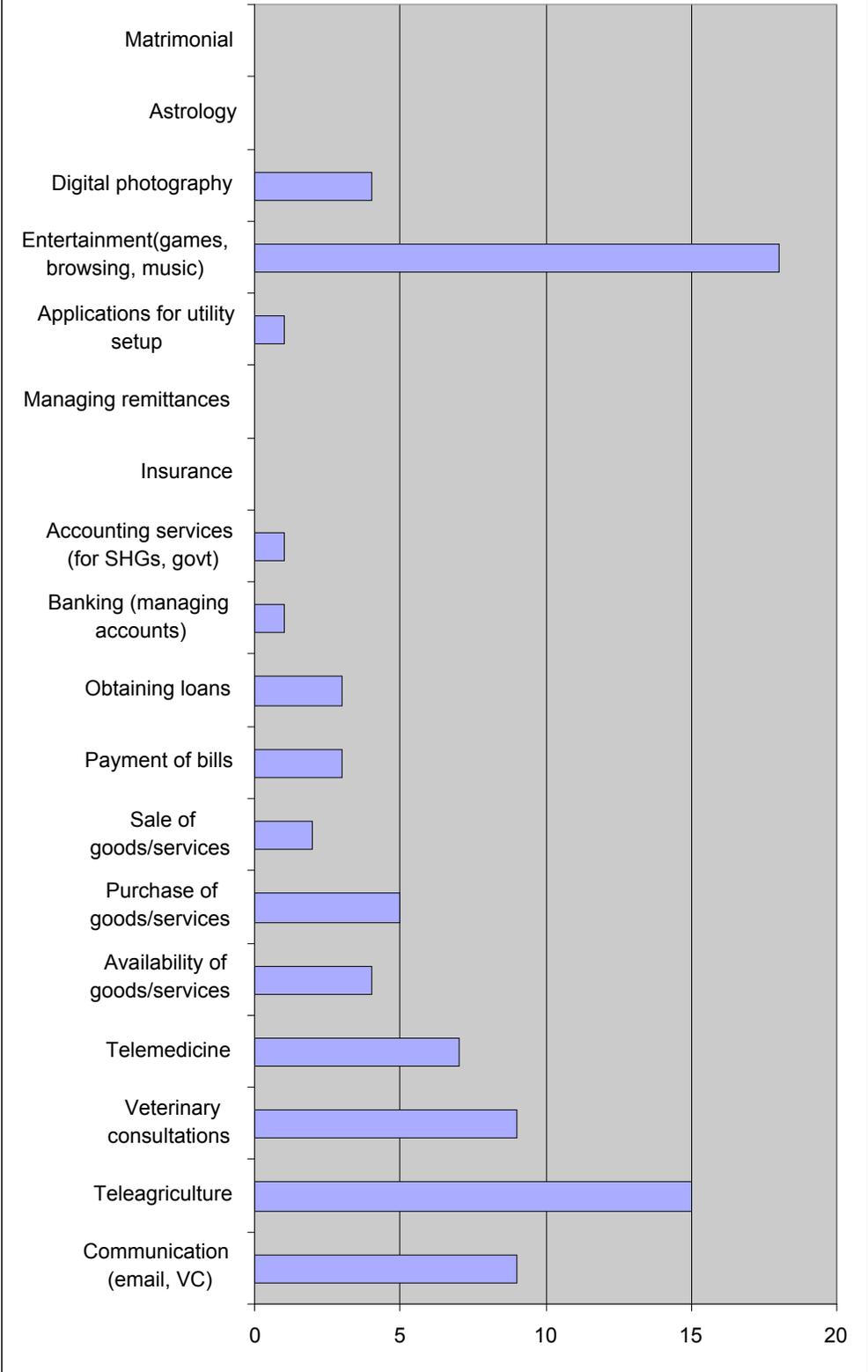
- a) Yes
- b) No

12. What problems do you face in using the ICT services?

	Rank: 0: not a problem 1: unimportant 2: slightly important 3: average 4: important 5: very important problem	List specific problems/examples
CONTENT PROBLEMS		
Illiteracy		
Unfriendly human intermediaries		
Difficult software interfaces		
Irrelevant information and services		
Inappropriate content packaging & presentation (absence of contextualization to suit local needs—Use of local language, simplification of content, etc.)		
Not aware about the possible usage of ICT in day-to-day life		
Outdated content		
GENERAL PROBLEMS		
Infrastructure problems (power, connectivity)		
Computer problems (inadequate number, slow)		
Time consuming		
Tardy response from the government		

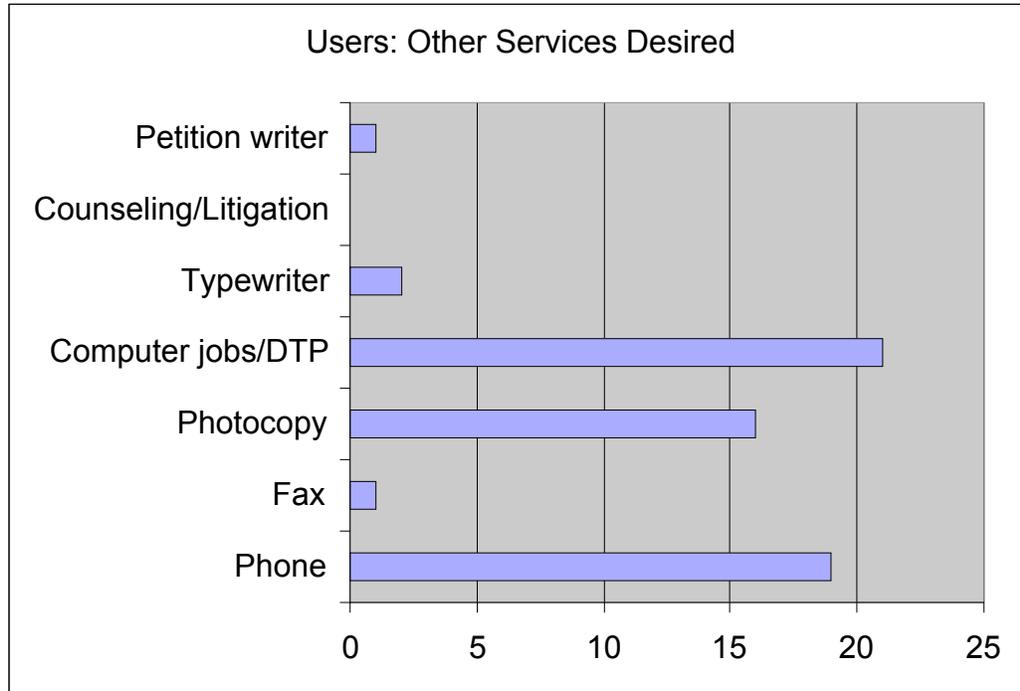


Users: Transactional Services Desired



Users: Informational Services Desired





<i>Current Information Sources by Popularity</i>
<ol style="list-style-type: none"> 1. PROJECT AUTHORITY 1. Government departments 2. Domain Eeperts 2. Internet 3. Private providers 4. Community 5. NGOs

<i>Perceived Economic Opportunities Created</i>
<ol style="list-style-type: none"> 1. ICT CENTRE OPERATIONS 1. Data entry operations 2. Providing computer training 2. Employment training/placement 3. Microenterprise development 4. Content collection 5. Content localization 5. Hardware maintenance 5. eCommerce

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